DESIGN, CONSTRUCTION, OPERATION OF METAL-WORKING AND ALLIED EQUIPMENT

MACHINERY

MAY, 1945

PRINCIPAL CONTENTS OF THIS NUMBER

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Thread-grinding practice has graduated from the tool-room and has become a recognized commercial machine-shop operation. A review of the principles involved in present thread-grinding practice with single-edge and multi-edge wheels will be given in an article to be published in June MACHINERY. Another outstanding article in that number will deal with methods developed by Buick for producing all-steel links for tracks of tanks, tank destroyers, and other track-laying military vehicles. Other subjects covered are the Selection of Cutting Fluids, and Precision Boring for Roundness and Concentricity.

Volume 51
Number 9

DEPARTMENTS

TOTAL DISTRIBUTION
20,625

PUBLISHED MONTHLY BY
THE INDUSTRIAL PRESS
148 Lafayette Street, New York 13, N. Y.

BRIGHTON, ENGLAND
MACHINERY, 17 Marine Parade

SUBSCRIPTION RATES: United States and Canada, one year, $4; two years, $7; three years, $8 (for Canada add 25 cents per year for war tax); foreign countries, $7 a year. Single copies, 40 cents. Changes in address must be received by the fifteenth of the month to be effective for the next issue. Send old as well as new address.

Entered as second-class mail matter, September, 1894, at the Post Office, New York, N. Y., under the Act of March 3, 1879. Printed in the United States of America.
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MACHINERY

Volume 51 Number 9 May, 1945

Present-Day Brazing Production Possibilities

By ARTHUR N. KUGLER, Mechanical Engineer
Air Reduction Sales Co., New York City

THE joining of metals by processes of brazing and soldering is an art that has been practiced since the days of ancient history. Most of the early uses appear to have been for ornamentation and jewelry, although the records show some applications on swords, daggers, and similar weapons.

A casual survey of literature dealing with ancient art brings to light some interesting facts. For example, the bases and spouts of the gold vases from Ur in Chaldea were fabricated separately and soldered to the main body with a gold solder. Similarly, gold bowls had separate handles soldered on, and ornamental gold balls were formed in halves soldered together. The antlers of stags in large copper panels from the temple of the goddess Mu-Khursagat Al'Ubaid (3100-2900 B.C.) appear to have been hammered from copper bars, the branches then being brazed to one another and to the main

element. In another ancient tomb, archaeologists discovered tubular copper canopy poles, hard soldered to copper pole sockets with a silver solder.

While the term "soldering" is used frequently in descriptions of these ancient works of art, it is quite obvious that the joining process described was one of brazing as we now know it, since all the metals used for joining were alloys of gold or silver with other metals, very similar to our present-day alloys. This process of antiquity has been carried down through the ages, experiencing such changes as man's advancing knowledge of metals proved desirable. Thus the smithies of a few centuries ago used the procedure for joining iron parts, substituting brass for the expensive precious metal solders. The bicycles of the "Gay Nineties" were made of brass-brazed tubular steel structures. Even today certain types of tanks are manufactured by brass brazing—true brazing, not braze-welding.

Apparently there has always been confusion in the terms used to designate the several processes. Since soldering today almost invariably connotes joining with low-melting temperature alloys, it is confusing to apply the term to the higher melting point metals. In addition, there is the operation of joining metal parts with a brass filler rod, similar to the brazing spelter applied on joints of types used in welding; this is also referred to as brazing.

Obviously, such confusion indicates the necessity for clarification. The American Welding Society has recognized the problem and appointed a committee for this purpose. While the writer does not predict what the final definitions will be, the following explanations may be offered as temporary expedients to clear up the confusion:

Soldering—A joining process involving generally lapped joints, into the lap area of which is flowed an alloy having a melting point not over 1000 degrees F. The alloy may be melted and applied with a torch, soldering copper, or electrical means.

Brazing—A joining process involving lapped or butt joints, into the joint area of which is flowed by capillary action an alloy having a melting point of at least 1000 degrees F., but lower than the melting point of the parts joined. The alloy may be melted and flowed by torch, furnace, induction heating, incandescent carbons, or by dipping in baths of molten salts.

Braze-Welding—A joining process involving butt, lap, or tee joints connected with groove or fillet welds deposited with a filler rod having a melting point of at least 1000 degrees F., but

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Arthur N. Kugler, the author of this article, is recognized as an authority on welding and brazing throughout the United States. He has an extensive background both of engineering and practical experience. For fifteen years, he has been connected with the Applied Engineering Department of Air Reduction Sales Co., specializing in the application of welding in various industries. He is a member of technical committees of the American Welding Society, the American Standards Association, and the International Acetylene Association. In addition to his other activities, he is consultant to the Chemical Warfare Service of the U. S. Army. Mr. Kugler is a graduate of Stevens Institute of Technology, is a licensed professional engineer, and is a member of the American Society of Mechanical Engineers, the American Society of Tool Engineers, and the American Welding Society.

lower than the melting point of the parts joined. The melting of the alloy, causing it to flow onto the joint surfaces; the preheating of the base metal; and the building up of the weld cross-section are accomplished with a torch or with the metallic arc or carbon arc procedures.

The phenomenon common to all these processes is the condition of the juncture between the filler metal and the base metal. The bonding of the filler metal to the base metal is purely a surface condition, in distinction to welding, where the base metal and the filler metal are both melted and flowed together.

The differences, then, in the three procedures lie first, in the temperature of operations; second, in the method of introducing the alloys into the joints; and third, in the analyses of the alloys used. Soldering is performed with alloys of lead, tin, and antimony in the approximate temperature range of 300 to 600 degrees F. Brazing is accomplished with alloys of silver, copper, zinc, cadmium, phosphorus, and other

Fig. 1. (Above Left) Photomicrograph Showing the Bond Zones in a "Sil-Fos" Braze between Bronze and Copper

Fig. 2. (Above Right) Photomicrograph Showing the Bond Zones in an "Easy-Flo" Braze between Stainless Steel and Copper

Fig. 3. (Right) Relation of Joint Thickness to Tensile Strength, Based on Butt Joints of Stainless Steel to Stainless Steel Made with Silver-copper-cadmium-zinc Brazing Alloy

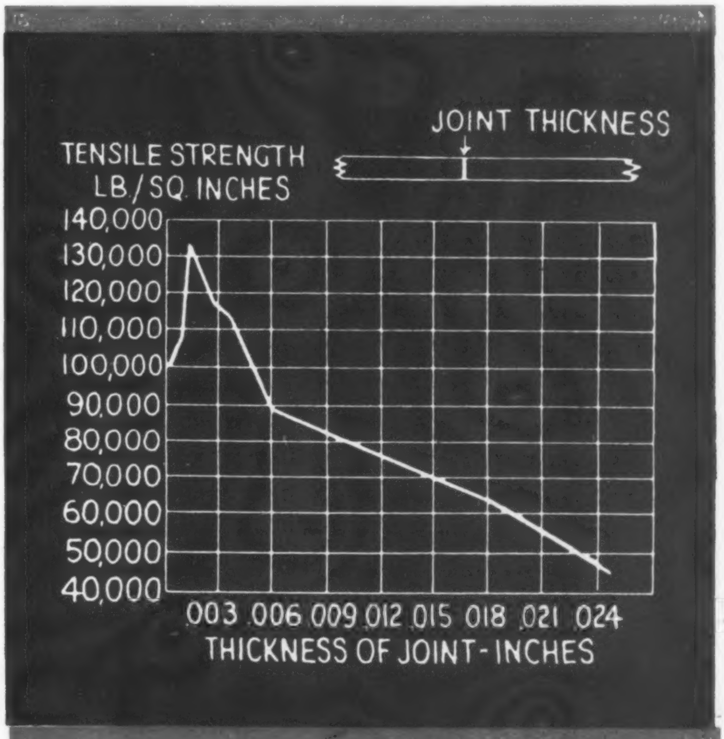


Fig. 4. Two Thin-walled Tubes Intersecting at 45 Degrees Brazed together with a Pre-placed Alloy Ring

metals in a temperature range of 1000 to 1600 degrees F. In braze-welding, the alloy is usually the familiar 60 per cent copper, 40 per cent zinc brass modified with additions of manganese, tin, iron, or silicon to achieve some particular properties. It is performed at temperatures of 1620 to 1680 degrees F.

Braze-welding is actually a composite of brazing and welding. Where the brass is "tinned" onto the base metal, the typical surface condition of brazing—sometimes referred to as intermolecular penetration—is found. However, in building up the intervening space between the tinned surfaces, brass is *welded* to brass. In view of these facts, "braze-welding" is a more accurate and descriptive term for this operation than "brazing."

Brazing of the present day represents a great advance over the methods of old. Research has developed a group of alloys, all with melting points substantially below that of the brazing spelters. Further, these alloys can be applied in a number of ways not possible with the older materials. For the joining of copper, brasses, and other alloys of copper, there are available two alloys, known as "Sil-Fos" and "Phos-Copper." Sil-Fos consists of 80 per cent copper, 15 per cent silver, and 5 per cent phosphorus; it is free-flowing at 1300 degrees F. A photomicrograph of a joint between bronze and copper made with this alloy is shown in Fig. 1. The other alloy in this group, Phos-Copper, contains 93 per cent copper and 7 per cent phosphorus; it flows at 1410 degrees F.

These brazing alloys should be used only on the copper and copper-base alloys, since phosphorus creates an unfavorable condition in the presence of iron. They find extensive use in copper and brass piping, copper radiators, and heat exchangers.

An alloy widely used in low-temperature brazing today consists of 50 per cent silver, with the balance approximately equal proportions of cadmium, copper, and zinc. This alloy, known as "Easy-Flo," is free-flowing at the exceedingly low temperature of 1175 degrees F., and readily penetrates close fitting joints. A joint in stainless steel and copper made with this alloy is shown in the photomicrograph, Fig. 2.

This material may be used on ferrous, as well as non-ferrous, metals, and in combinations of the two. This is a distinct advantage, as it permits all manner of combinations of dissimilar

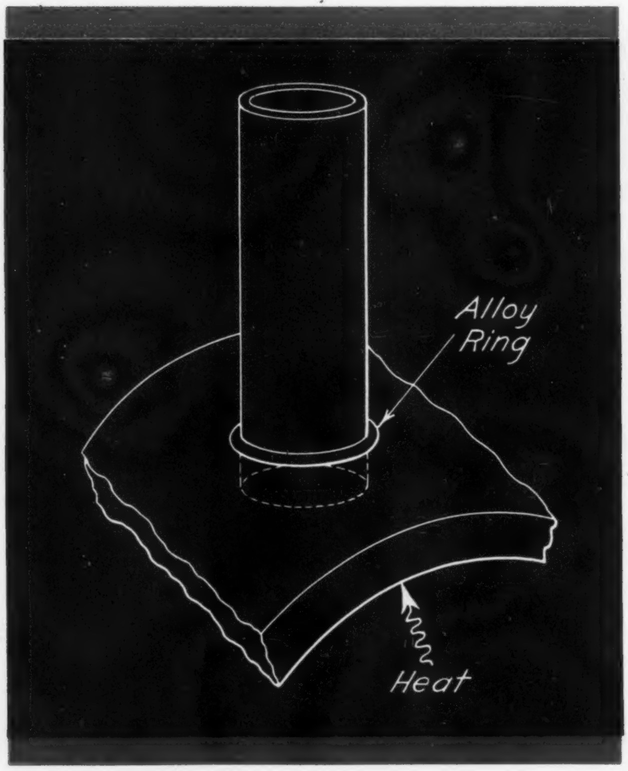


Fig. 5. Diagram Illustrating Method of Assembling a Thin-walled Tube Radially in a Large Heavier-walled Tube. Observe the Placement of the Alloy and Point of Heat Application

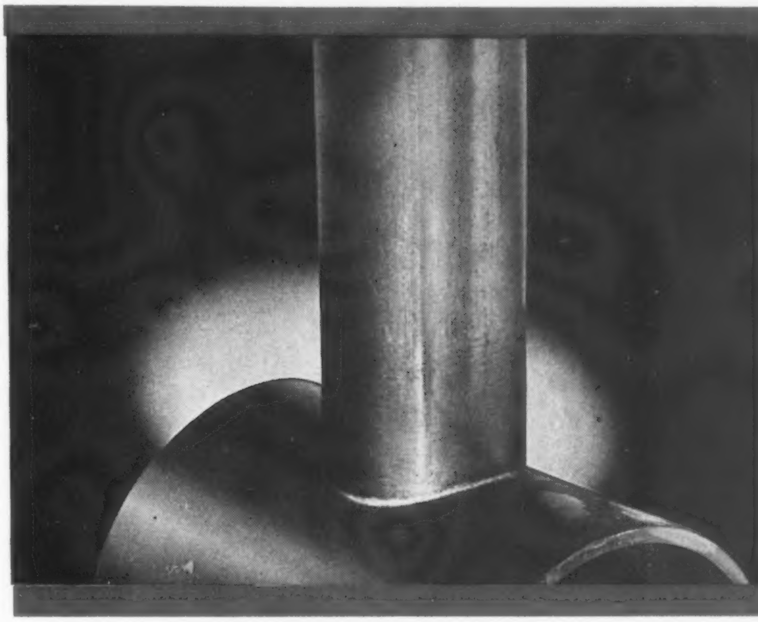


Fig. 6. Brazed Joint in Thin-walled Tubing Joined to Heavier-walled Tube, Prepared and Brazed as Illustrated in Fig. 5

metals. The low flow point serves to keep distortion to a minimum and conserve heat. For these reasons, this alloy has proved most useful in war production, and offers attractive possibilities in post-war planning.

There is another alloy of substantially the same composition as the one just described, except for the addition of about 3 per cent nickel. This alloy flows at 1270 degrees F. and is, in general, suitable for the same classes of work as its lower melting counterpart. However, it finds its greatest application in the brazing of large-diamet copper piping and fittings for marine service. The next important use is in the field of carbide-tool tipping, and to a lesser extent in the reclamation of damaged tools. Originally, the addition of nickel in this alloy was for the purpose of improving its corrosion resistance. This composition flows more sluggishly than the one of lower melting point.

This alloy may also be used on assemblies where it is necessary to perform the brazing in two operations, thus requiring that the first braze-melt be at a higher temperature than the second, in order to avoid loosening the first joint.

To attain the maximum benefits from the use of these alloys, it is necessary that certain principles of design and procedure be followed. The design of joint for low-temperature silver-alloy brazing is largely governed by the shape of the parts to be joined. However, the selection of a lap or butt joint is controlled by such factors as ease and uniformity of preparation, reliability of finished product, and economy of operations.

While it must be admitted that butt joints can be brazed and will yield strong connections, it must also be realized that this joint requires the most careful preparation. Clearances of about 0.002 to 0.003 inch must be maintained if maximum strength is to be obtained. This is clearly

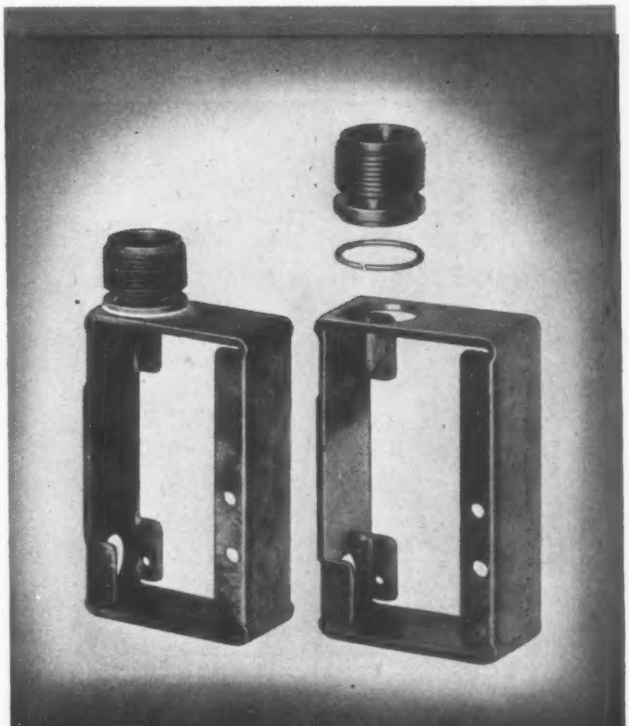


Fig. 7. Micro-switch Enclosure after being Brazed (at Left) and Parts Used in Assembly, Including Alloy Ring (at Right)

Fig. 8. Another Example in which Brazing Alloy of a Suitable Shape is Pre-placed around a Lug to be Joined to a Formed Cup

illustrated in Fig. 3 by a graph plotted to show the relation between the thickness of alloy in the joint and the strength of the joint.

These particular tests were made on stainless steel, since it was possible with this metal to obtain a great range of values. Note that with a joint thickness of about 0.0015 inch a tensile strength of approximately 133,000 pounds per square inch is obtained, but that as the joint is widened, the strength decreases very rapidly. Unless manufacturing conditions can be so controlled as to give assurance of this high degree of accuracy in fit-up, the butt joint had best be ruled out for production work. Of course, if the job does not require great strength and if the assembly can be economically handled with the butt connection, this method may prove feasible.

Generally speaking, the lap type of joint proves more economical for production work, since it provides tolerances that can be met with the forming and machining operations commonly employed. However, it is just as important with lap as with butt joints to maintain the correct thickness of alloy or, as it is sometimes expressed, joint clearance. Experience with lap joints has shown that if this clearance is maintained in a range of 0.003 to 0.005 inch, thoroughly reliable and strong connections will be secured. The reasons for keeping this clearance small will be appreciated when it is realized that such joints are stressed in shear. If the cross-section of alloy is too great, bending

Fig. 9. Switch Box on which a Number of Bosses and a Square Piece are Simultaneously Brazed

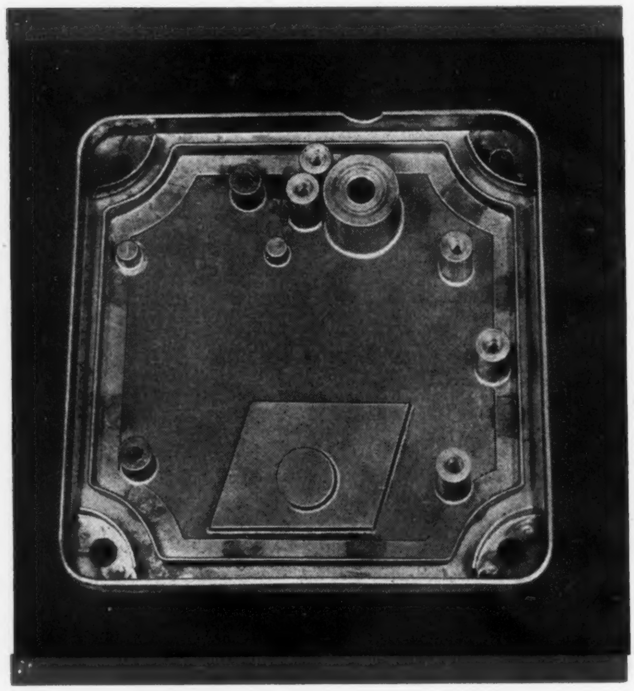
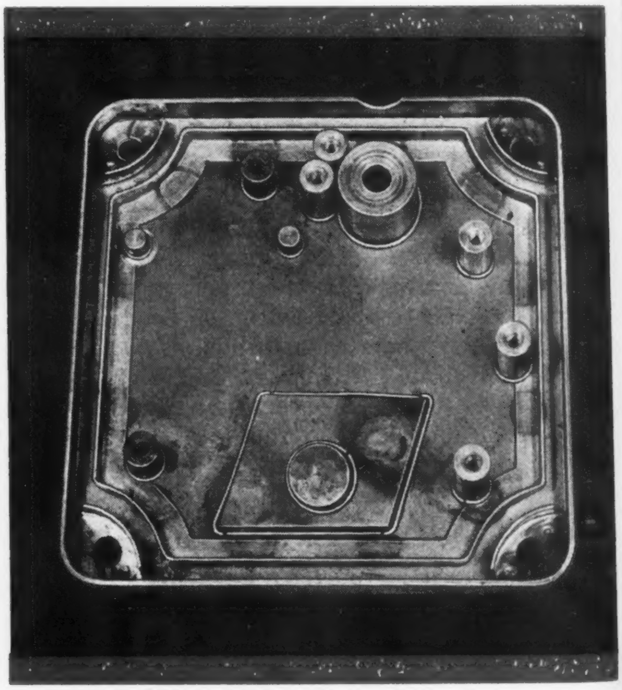


Fig. 10. Switch Box before Brazing, Showing Arrangement of Pre-placed Pieces of Brazing Alloy



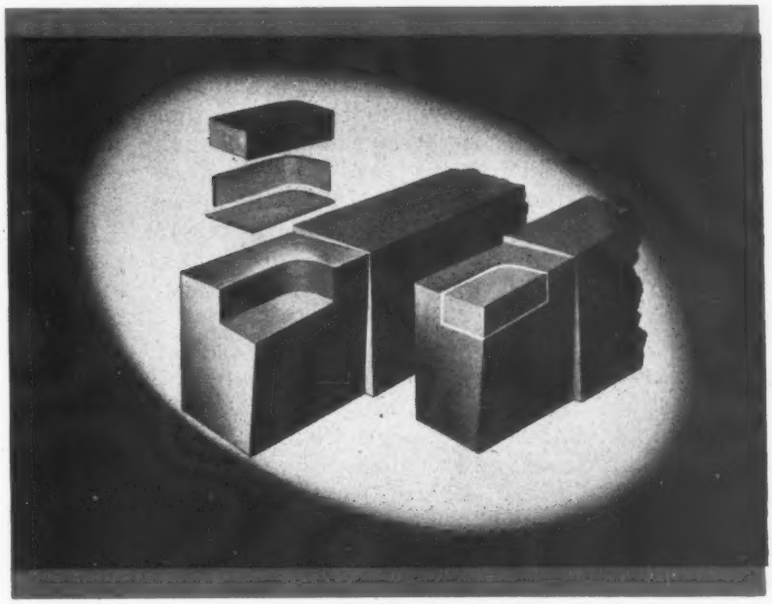


Fig. 11. Illustration Indicating Preparations Made in Brazing Carbide Tips to Steel Shanks

stresses will be set up, causing failure to occur at low values.

The other critical dimension in the design of brazed lap joints is the depth of lap. This is usually set at three times the thickness of the thinner member joined. In the case of dissimilar metals, it may be necessary to calculate this value. This may be done by computing the strength (either total or on a unit length basis) of the weaker member and equating it to the area of braze multiplied by the unit shear strength of the brazing alloy (taken at 25,000 pounds per square inch) and the factor of safety.

In calculating the area in this equation, the length of joint will be known, but the depth of lap will be unknown. By solving for this unknown, the necessary depth of lap will be found. The factor of safety may be taken as between 2 and 5, depending on service conditions and the type of stresses involved. For low stresses and static loading, a value of 2 will be sufficient; where vibration or dynamic stresses are involved, a higher value should be employed. The same figures plus the clearance of the joint will permit of calculating the theoretical quantity of alloy necessary to make the joint.

The factors involved in correct brazing procedure are: (1) Cleaning of the parts; (2) fluxing of the joint; (3) application of the alloy; (4) heating the joint; and (5) cleaning of the finished assembly.

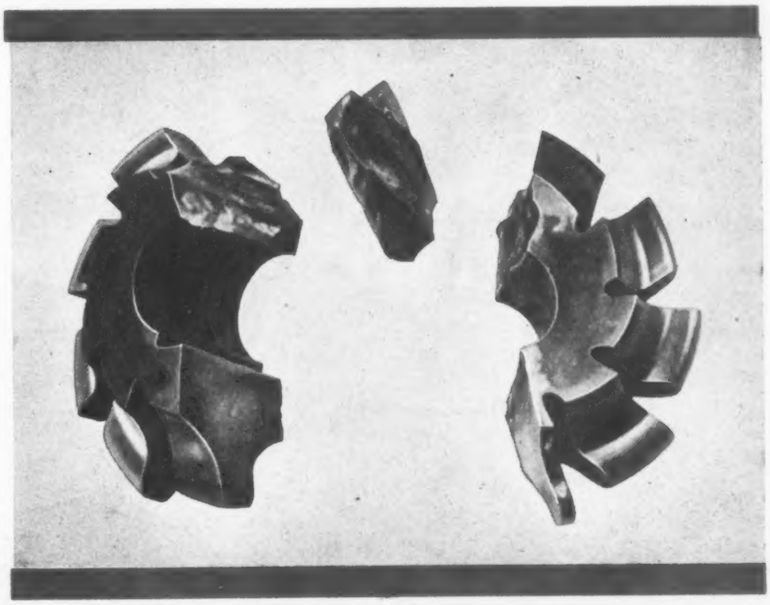


Fig. 12. Broken Milling Cutter Economically Repaired by Silver Alloy Brazing

Cleaning of parts, particularly in the joint area, is of vital importance. Improper or insufficient cleaning is probably responsible for more failures in brazed joints than any other single cause. Parts that have been through screw machine operations, or stampings or punchings, are likely to be covered with oil or other compounds which, unless removed, will certainly lead to defective brazed connections. Similarly, oxides and corrosion will prevent successful brazing.

Cleaning may be accomplished by chemical or mechanical means, depending on the conditions encountered. Degreasing equipment is usually employed to remove oil and grease. It should be noted here that highly polished surfaces are not as desirable as slightly roughened ones, since the latter characteristic seems to facilitate the flow and penetration of the alloys. After cleaning the parts, it is important that they should not be handled with the bare hands, as there is evidence that the oils from the hands may prevent the alloy from flowing properly.

After cleaning and before brazing, it is necessary to apply a flux that will clean the joint area of the slight remaining film of oxides and promote flowing of the alloy. In order to perform its function, this flux must become fluid and remain active over the range of temperatures in which the alloy flows. Borax and braze-welding fluxes are unsuited for this work, since they melt at temperatures well above the flow points of these alloys. The quantity of flux to apply is largely controlled by the shape and size of the parts. It should be sufficient to insure proper cleansing of the joint area, but not so large as to create a subsequent cleaning problem.

The method of applying the brazing alloy depends upon the quantity of pieces to be produced and the rate of production. For individual jobs and small production, hand-feeding of the alloy from wire or rods is usually the best procedure. For high-production manufacturing, pre-placement of the alloy is the logical solution to the problem. This feature will be discussed in greater detail later, as it is the key to production operations.

The means of heating the parts to effect flowing of the alloy is determined by the number of pieces involved and the rate of production. Certainly, for individual jobs there is no better means than the universally available oxy-acetylene welding torch. Also, for production brazing on metals of high heat conductivity the oxy-acetylene flame proves advantageous.

On some classes of work, air-acetylene flames or combinations of air or oxygen with propane or city gas will be satisfactory. Incandescent carbon brazing has a field of application on work such as electrical connections. Furnace brazing,

Fig. 13. Tinning the Cleaned, Fluxed, Broken Surfaces of the Milling Cutter in Preparation for the Brazing Operation

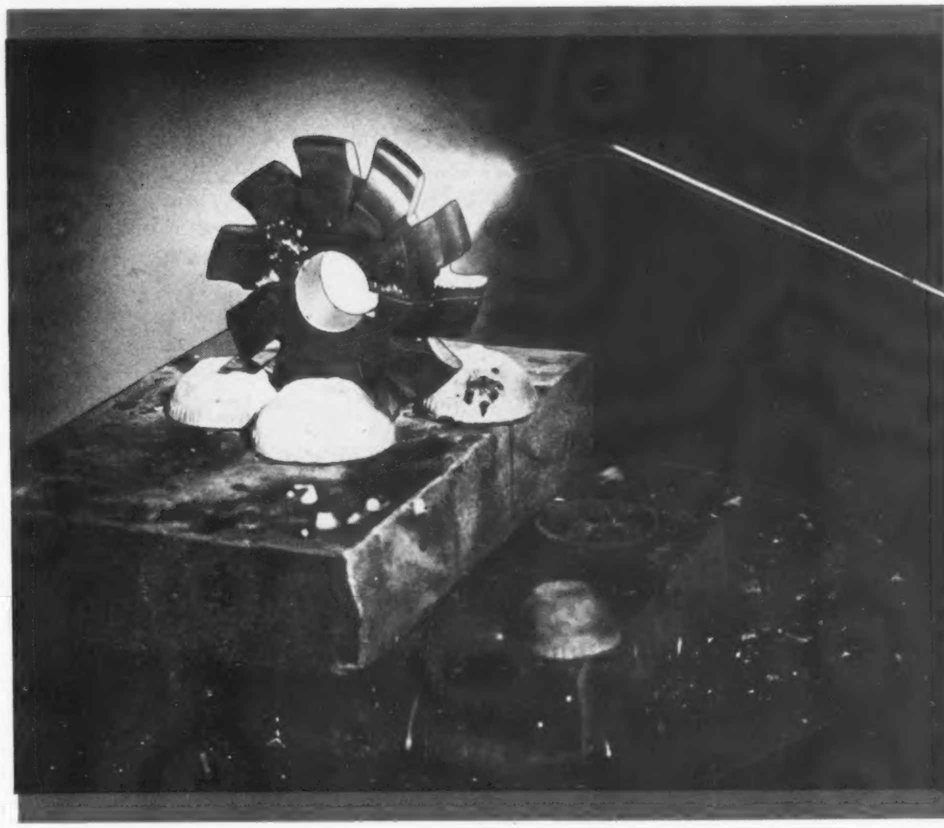


Fig. 14. The Broken Milling Cutter is Shown Assembled after Tinning, and Heating is being Started for the Brazing Operation

either continuous or in batches, offers possibilities for relatively small units that do not require elaborate jigging.

Induction heating has proved successful on many wartime-production brazing problems. It is particularly useful on ferrous metal parts that can be accommodated within the coils. For straight-line production in large quantities, two methods are available: First, radiant gas burners using city gas and air; and second, multiflame torches burning city gas under pressure with oxygen. By the application of suitable controls, operations can generally be made automatic, except for loading the conveyor or feeding mechanisms.

If the right amount of flux has been used, no great amount of cleaning is necessary; usually, a bath in hot water will remove the spent flux. Insufficient flux is likely to cause more trouble than excessive applications. When too little flux is employed, it becomes "loaded" with oxide, and upon solidifying, leaves a glasslike residue, which can be removed only by vigorous scrubbing in hot water.

In meeting the unprecedented demands of war production, certain new techniques and refinements of old procedures have been evolved which offer possibilities for post-war manufacturing. It should be obvious that, in employing hand methods of brazing, a certain degree of skill is required of the operator. This, naturally, makes the success of the operation dependent upon the human factor. One of the principal features of high-production techniques is the removal of the personal element.

In brazing, this has been achieved by the preplacement of the alloy and the employment of semi-automatic or automatic means of heating, together with some form of conveying system. One distinct advantage of this method is that it is frequently possible to braze several joints simultaneously.

The silver-copper-cadmium-zinc alloy has been used to a very large extent on this type of work. It is available as wire, rod, and sheet in a wide variety of sizes ideally suited to this method. Assuming an assembly correctly designed for silver brazing, the next step would be to determine the amount of alloy needed, either by calculation or by brazing several samples with different sizes of alloy.

When the required amount has been decided upon, the form of pre-shaping it for application to the part must be decided upon. If the part is circular, a wire ring will probably be best. If the circular part must lap over an extended flat area, perhaps a flat washer stamped from sheet will prove better. In short, the formed alloy should follow roughly the shape of the joint at the point of application. It is also im-

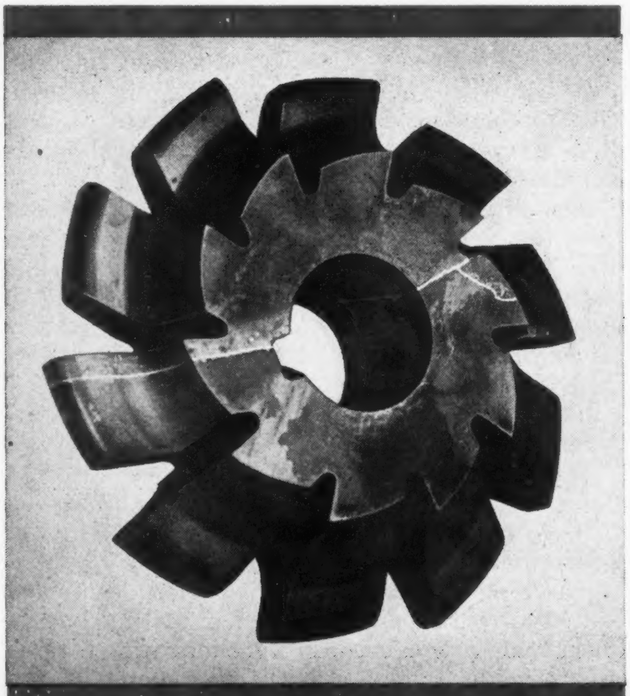
portant to have the ring or washer in contact with the joint, so that when it becomes molten it will flow into the joint area by capillary action.

One other point should be observed in setting up for pre-placed alloy brazing. The formed alloy should be so placed in the assembly as to be remote from the point of heat application. If the alloy is exposed to the direct heat of flames, for example, it will become molten before the base metal has reached the proper temperature, and as a result, will flow all over the part.

The correct placement of the alloy in the manner mentioned has another advantage in that it provides a ready means of checking on the completion of the joint. In furnace and induction brazing, the necessity for following this procedure may not be as imperative as in other methods. However, its value as a visual means of checking the joint cannot be overlooked. In this discussion of pre-placement of alloy, it is assumed that proper fits of the component parts will be maintained, that the pieces will be adequately cleaned, and that the fluxes will be correctly applied.

Pre-placed alloy brazing was employed in making the joint illustrated in Fig. 4, which consists of an intersection of two tubes at an angle of 45 degrees. Prior to the brazing operation, a ring of alloy slightly larger than the inside of the intersecting tube is formed and "snapped" into this tube in such a manner that it projects slightly.

Fig. 15. The Repaired Milling Cutter Shows Only Fine Lines of the Silver Alloy Brazing Material



After applying flux to the cleaned surfaces, heat is applied to the joint by means of two opposing flat torch tips, each producing a ribbon of flames about 1 1/2 inches long. These flames are oscillated through an arc of about 1 inch. With a tip such as this, burning oxygen and city gas under a pressure of about 5 pounds per square inch, this joint can be made on tubes of 1 inch outside diameter by 0.065 inch wall thickness in about twenty-five seconds.

Another example is a tube inserted within a larger tube at right angles to the latter and brazed in position, as indicated in Fig. 5. On a job like this, heating must be performed from the inside of the larger tube, and the alloy must be placed around the small tube on the outside of the large one.

A joint brazed in this manner is shown in Fig. 6. If the small tube were inclined at 45 degrees, only a half ring would be used, but the alloy would flow completely around the joint. It will be observed that in each instance gravity is used to assist the flow of the alloy. In hand-brazing operations, it is possible, by appropriate direction of the heat, to cause the alloy to flow upward. However, when very limited torch movement is possible, it is safer to have the alloy flow downward.

In Fig. 7 are seen the component parts, including the alloy ring, that go into the brazing of micro-switch housings. The parts are furnace-brazed together. Fig. 8 demonstrates another shape of alloy for pre-placement, this photograph having been taken before the joint was brazed, in order to show the shape of the alloy piece.

A multiplicity of joints simultaneously brazed on a switch-box cover is seen in Fig. 9. Before brazing, wire alloy was placed around the various bosses and the large quadrilateral shape, as indicated in Fig. 10. Of particular interest is the method of placing the wire around the quadrilateral shape. In all other instances, rings of the wire were used.

Pre-placement of the alloy is not a new idea. Before the war it was employed to braze spuds in tanks, the brazing alloy being used in the shape of washers stamped from sheets. Another form of pre-placement is used in manufacturing brass pipe fittings, a ring of alloy being placed in a groove inside the bore that receives the pipe. When properly cleaned, fluxed, and heated, this alloy ring melts and flows into the annular space between the pipe and the fitting.

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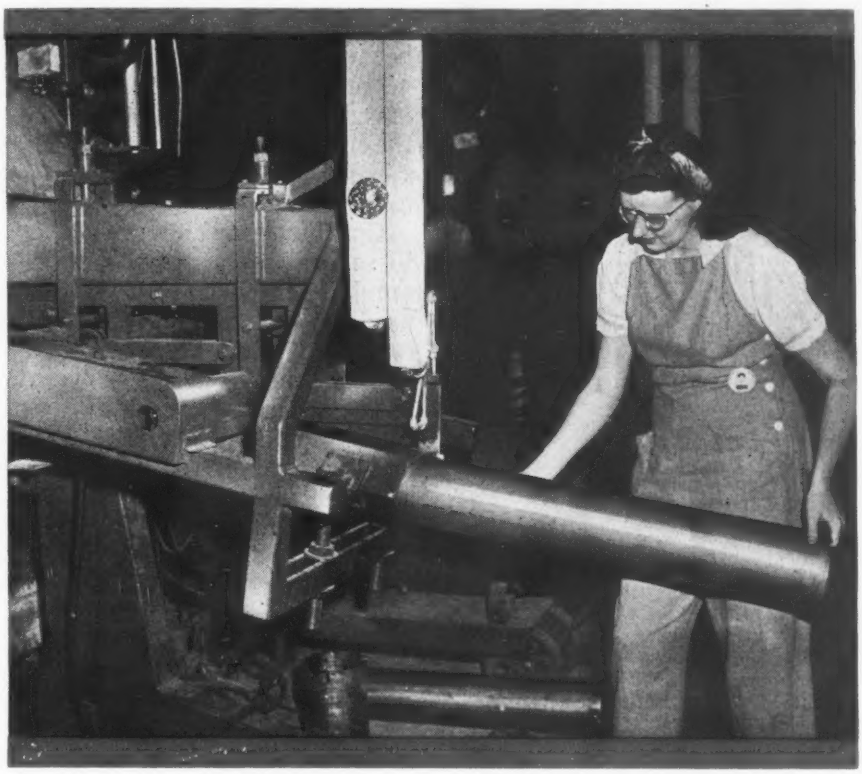
Continuous Welding of Tubular Containers



How Cylindrical Containers are Welded at a Rapid Rate at One of the Plants of the Rheem Manufacturing Company by a Process Known as "Submerged Melt" Welding

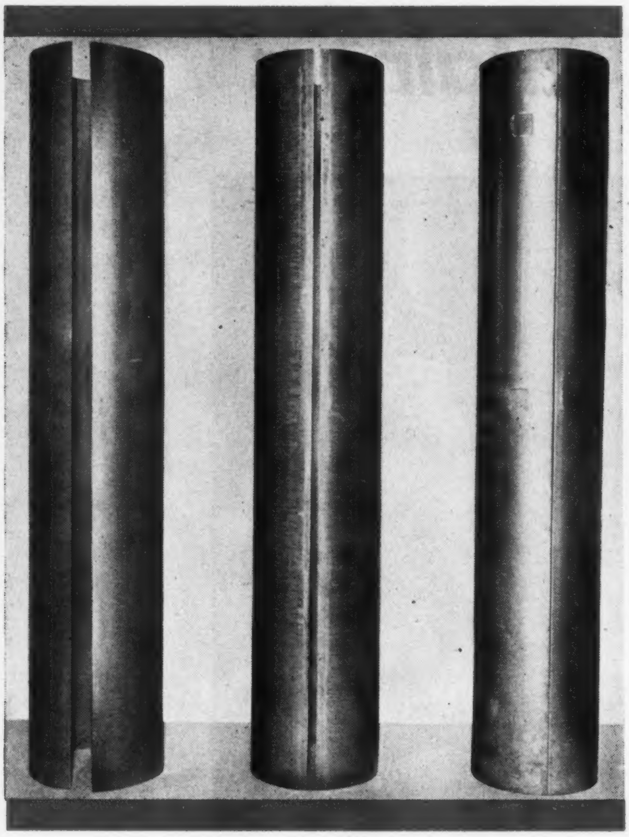
By R. V. ANDERSON, Chief Welding Engineer
Rheem Manufacturing Company

THE manufacture of tubular containers made from a flat sheet rolled into the form of a cylinder, with the seam welded, has become an important item in both war and peace production. The containers thus made can be of any reasonable length, since the seam can be welded without serious length limitations. The welding of the seam of these containers is dealt with in this article.

Previous to the development of the procedure to be described, this weld was produced by arc welding, employing a wash-coated wire on a butt seam, or by carbon arc welding on a lap seam. The work was performed by placing the tacked cylinder on the mandrel of a double welding fixture, the work being stationary and the welding head moving. With this method, the welding was considered rather slow and other disadvantages were recorded.

Briefly, the facts were: (1) Travel rate of welding head, 24 inches a minute; (2) the "down time" for clamping, adjusting, removing, and placing the cylinders in position for welding was twice the welding time, unless two operators were employed; (3) the repair time was from four to five times the welding time; and (4) the resultant weld did not have a good appearance.

To overcome these disadvantages, three methods were suggested: (1) Resistance flash weld-



ing. It was estimated that to do the work by this method, an investment of $70,000 would be required. (2) Automatic gas welding. For this method, an investment of $25,000 would be required. (3) "Submerged Melt" welding. In this case an investment of $7000 would be needed. The capital investment was an important item, because whichever method was chosen, the investment would have to be multiplied by several installations in many different plants. Ultimately the problem was solved by the use of "Submerged Melt" welding and a continuous welding fixture.

Continuous welding fixtures have been used in several instances in the past. A typical example is the General Electric table type fixture used in the automotive industry for welding torque tubes. A later method is the cannon type fixture employed by several manufacturers. These fixtures are designed for "Submerged Melt" welding. The welding head is stationary and the work is fed in at one end of the fixture and removed at the other. The travel rate past the welding zone obviously represents the welding "footage" per minute or hour.

This type of fixture is adapted to both small and large diameters of tubing, and is not necessarily limited to circular cross-sections. By the use of suitable guides, oval, square, or many-sided tubes can be fabricated. The thickness of the material may be from 20 to 10 gage. Practically all metals that would ordinarily be used

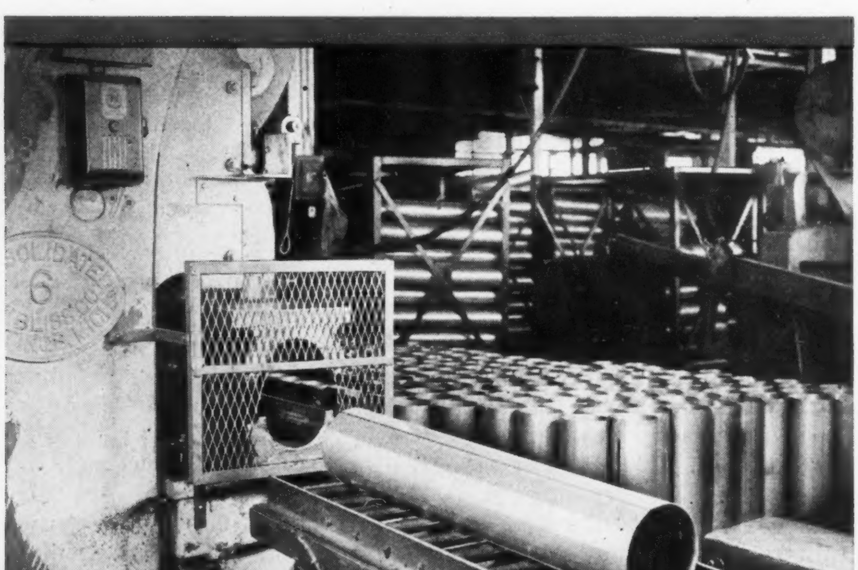


Fig. 1. (Above Left) Tubes Rolled into Cylindrical Shape by Different Methods. The Tube to the Right is the One that is Satisfactory for Continuous Welding

Fig. 2. (Left) The Tube as It Comes from Final Forming Operation Ready for Welding

seem to be within the scope of the process—mild steel, hot and cold rolled, black or pickled; stainless or nickel steel; copper and its alloys.

This type of welding method and fixture have proved so successful that approximately forty such fixtures have been made up to the present time for welding containers. In the Rheem plant, these fixtures have been used for 14-gage sheet, formed into cylinders 6 inches in diameter and approximately 35 inches long, made from hot-rolled pickled and oiled stock and black hot-rolled stock. The analysis of the sheets is as follows: Carbon, 0.08 per cent; manganese, 0.33 per cent; phosphorus, 0.012 per cent; sulphur, 0.034 per cent; and silicon, 0.008 per cent. The ultimate strength is 48,000 pounds per square inch, with a yield point of 30,000 pounds per square inch. The elongation in 8 inches is 28 per cent, and the Rockwell B hardness 55.

Operations Preliminary to Welding

Previous to welding, the sheets are sheared or blanked, formed, and cleaned. These operations are as important as the actual welding, because, if not properly done, they may affect the welding operation to such an extent as to make the weld unsatisfactory.

Fig. 1 shows cylinders to be welded after the sheet stock has been formed into a tubular

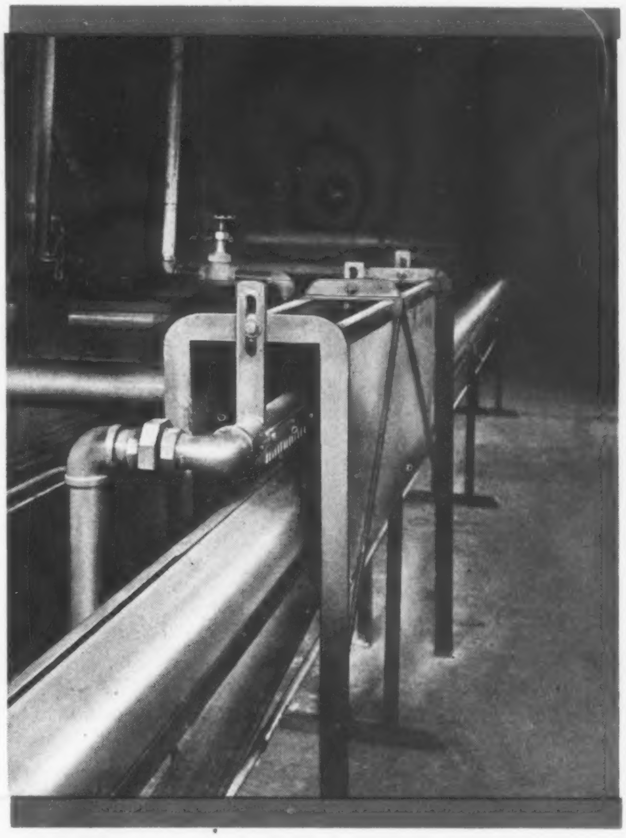


Fig. 3. (Above Right) Feeding the Formed Cylinders underneath Gas Flames to Burn off any Oil that may be Left on the Surfaces to be Welded

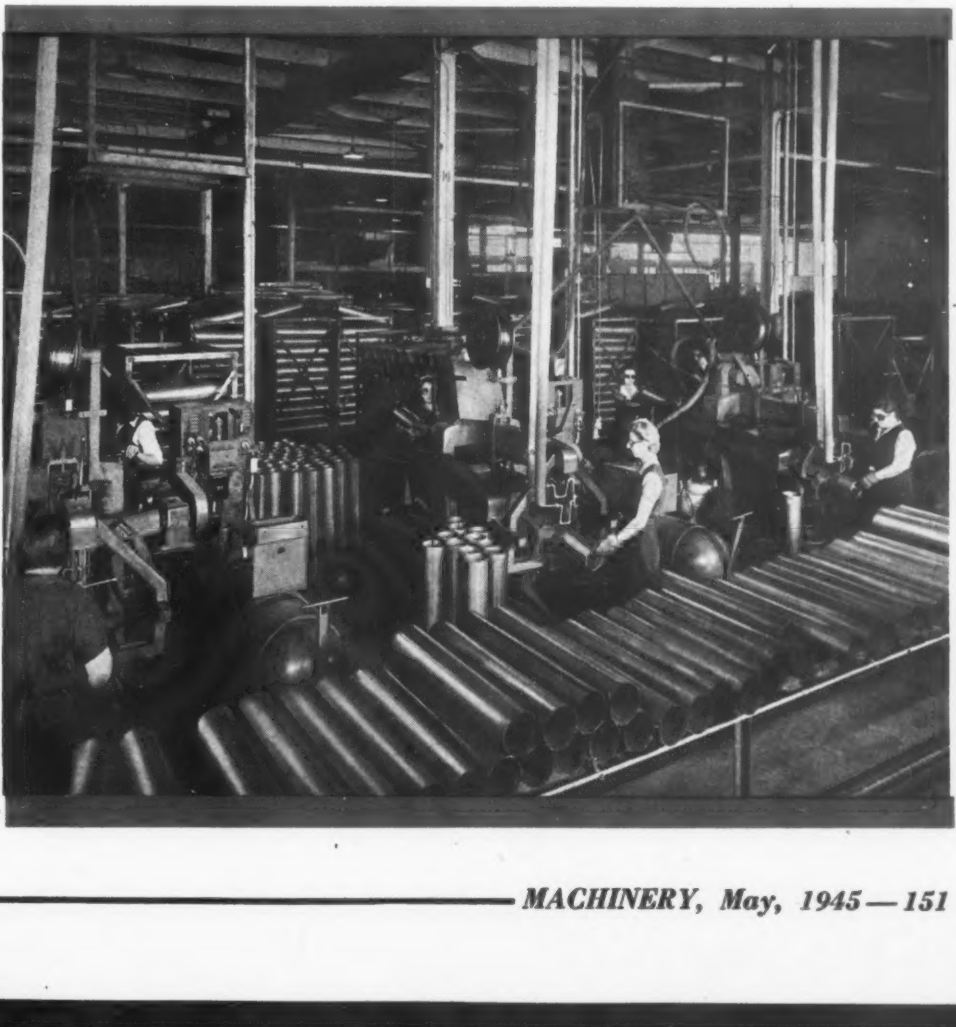


Fig. 4. (Right) View of Three Welding Machines Seen from the Rear or Charging End

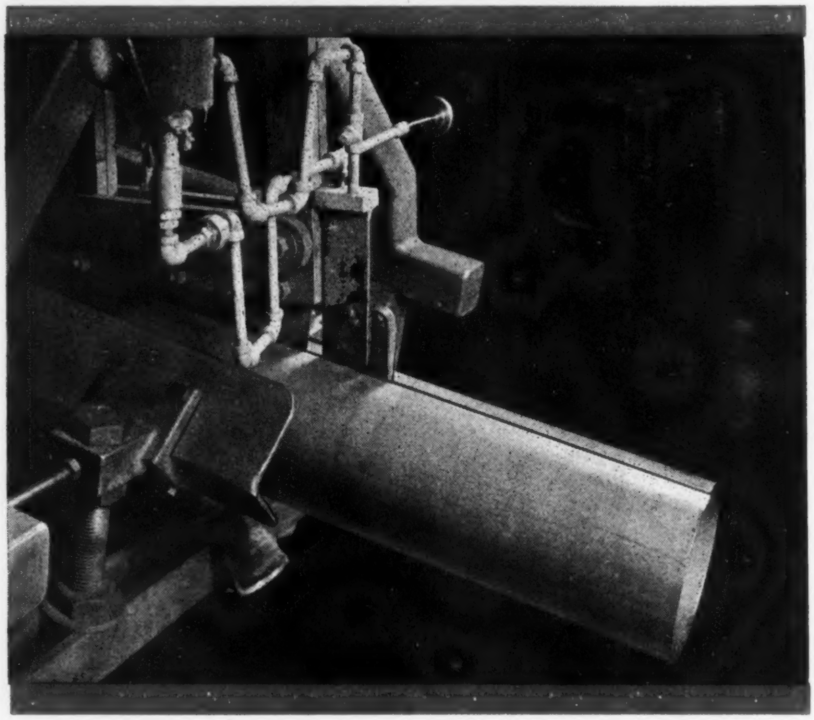
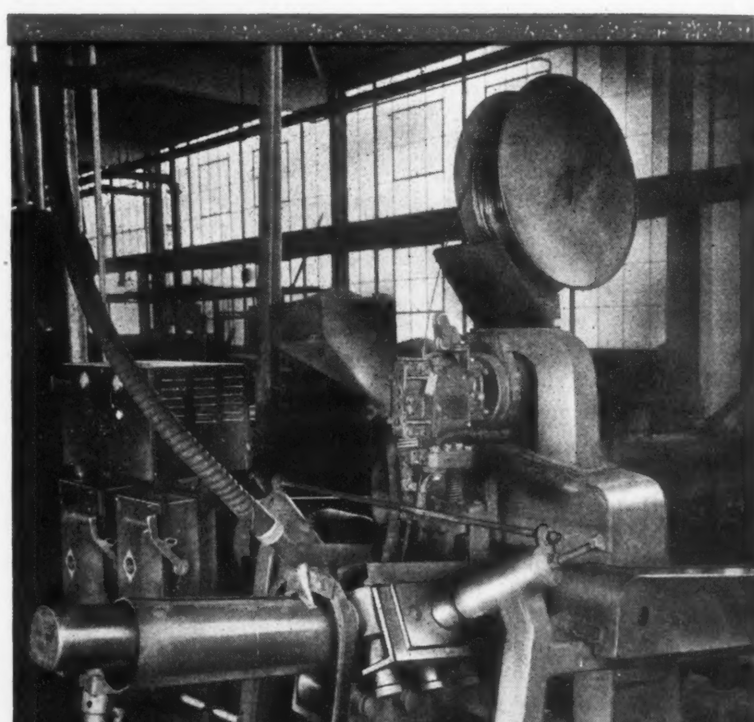


Fig. 5. (Left) Close-up View of the Feeding End of a Welding Machine, Showing a Cylinder being Fed into It

Fig. 6. (Below) Close-up View of the Front End of the Machine or Fixture, Showing a Completely Welded Cylinder Emerging

shape. The methods used in forming the cylinders shown at the left and in the center did not prove wholly satisfactory, because there was a flat extending back from the welding edge a distance of 1/2 to 3/4 inch, and the edges did not come together properly. At the right is shown the result of another method of forming, where the flat area immediately adjacent to the joint is practically eliminated and the welding edges are in contact. This is a good formed section, suitable for welding in the fixture to be used.

In order to obtain the right kind of formed tube for high-speed welding, it is necessary to see that (1) the sheets are blanked square and to size; (2) that the tube is formed to a true circle, and that the welding edges are in contact; and (3) that there is no oil, water, dirt, rust, or foreign material on or adjacent to the surfaces to be welded.



Equipment Required for the Welding Process

The equipment used for welding the container tubes is a continuous welding fixture, a Unionmelt U type welding head and controls, a 600-

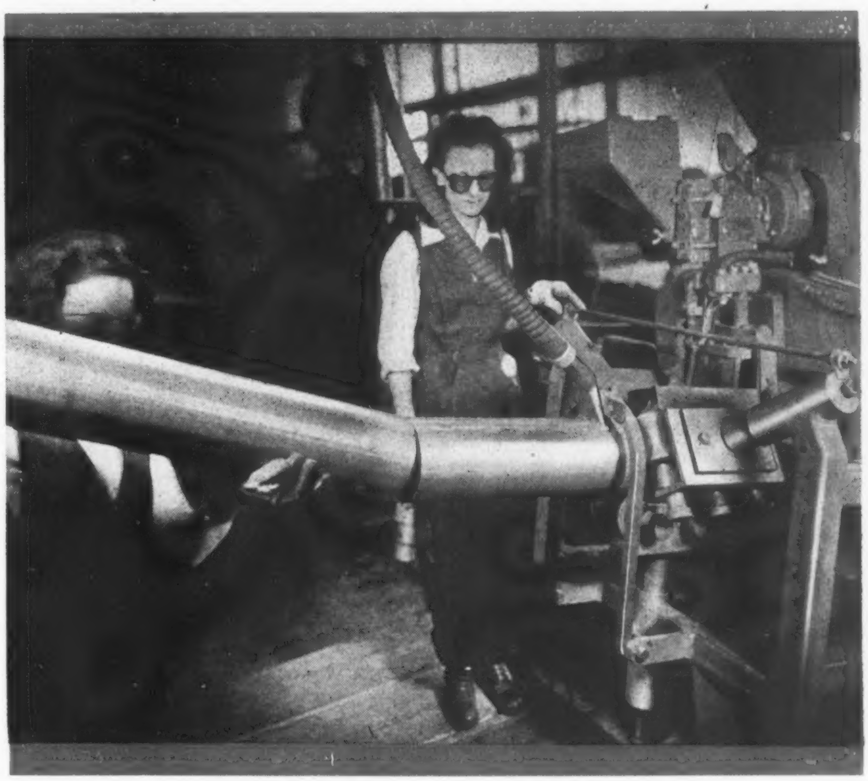


Fig. 7. Breaking off the Completed Cylinder from the One Following; the Cylinders are Joined together because of the Continuous Nature of the Welding Operation

ampere motor-generator, a vacuum flux pick-up, and a relay for breaking the exciter field. The amount of wire consumed per foot of weld averages from 0.017 to 0.034 pound, and the amount of Unionmelt flux used per foot of weld, from 0.02 to 0.04 pound, depending on the amperage required for the welding operation.

Step-by-Step Procedure in Manufacturing

Before the tubes arrive at the welding machine, the forming is accomplished on three presses. The first press bends up the sides or ends of the sheet, the second press forms the sheet into an oval shape, while the third press forms the sheet into a complete tube, with the edges to be joined close together. Fig. 2 shows the tube as it comes from the final forming operation.

The next step is to feed the surfaces to be welded on the formed cylinders beneath city gas flames for the purpose of burning off any oil left on these surfaces. (See Fig. 3.) After having passed through this operation, the cylinders are wiped off and placed on the table behind the welding machines, as indicated in Fig. 4, where three welding machines are shown in operation. A close-up view of the in-feed end of these machines is shown in Fig. 5.

In Fig. 6, which shows the front end of the welding jig, a completely welded cylinder is seen emerging from the machine. The work shown is a cylinder, 6 inches in diameter and 35 inches long, made from 14-gage steel. This particular machine operates at 27 volts and 260 amperes, using Oxweld No. 36 welding rod, 1/8 inch in diameter, supplied in small coils, and Unionmelt welding compound No. 90 grade, 12 x 200. A Type U electronic control is used, and power is supplied from a 600-ampere direct-current motor-generator set. The welding is done at the rate of 130 inches per minute, the welding time being sixteen seconds per tube. In this particular case, the amount of Unionmelt welding compound used per foot of weld is 0.02 pound, and the amount of welding rod used per foot of weld 0.017 pound.

As one tube is fed through the machine immediately behind another, the welding being continuous, each tube will be joined at the seam to the next preceding one; and as the tubes emerge from the machine, each one must be broken off from the one that follows. How this is done is indicated in Fig. 7, where the operator is shown breaking off successive cylinders as they come from the machine.

The next and final step in the manufacture of these welded tubes is to subject the completed cylinders to an air pressure test under water, as shown in Fig. 8. This is an automatic, continuous process.

With the continuous welding process described, it will be noted that after the proper adjustments of the fixture have been made, the

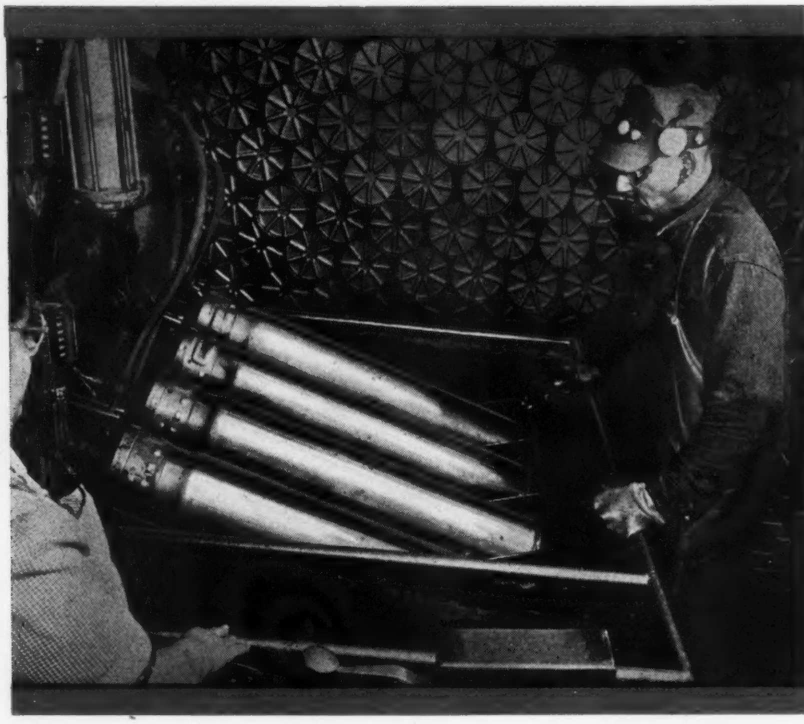


Fig. 8. Testing of the Completed Cylinders by Air Pressure. This is an Automatic Continuous Operation

work is simply fed in at one end and removed at the other, completely welded. As a general rule, the rate of travel varies from 70 to 210 inches per minute, but a production speed of 130 inches per minute, as used in the case illustrated and described, is considered a good average.

Summary of Advantages Gained by Using the Continuous Welding Process

Briefly, the advantages that may be recorded as due to the continuous welding process are as follows: (1) The welding jig represents a decided improvement for continuous work; (2) the welding speed is from four to eight times that possible with arc welding using wash-coated electrodes; (3) the physical properties of the deposited metal are better than those of the parent metal, and the appearance of the weld is good; (4) unskilled labor may be used; (5) no protective clothing, gloves, or hood is necessary, as there are no fumes or open arcs; (6) the total welding cost, including power, materials, labor, repair, and maintenance, is only a small percentage of the cost of arc welding with a hand-operated fixture; and (7) the weld "slags" itself.

Manual on the Employment of Handicapped Veterans

A MANUAL entitled "Analyzing Job Demands and Physical Handicaps of Veterans and Civilians" has been prepared by the Dunwoody Institute, Minneapolis 3, Minn., with the hope that it may help those engaged in the difficult task of finding suitable occupations for either handicapped veterans of the war or other handicapped persons. The manual uses employment in the printing industries to illustrate the process of analysis, but the method will serve equally well in any industry or type of employment. Master charts are available pertaining to other industries, including machine shops, mechanical drafting, sheet-metal work, arc and gas welding, the electrical industries, building construction (including architectural drafting, painting, and decorating), air-conditioning, and automotive trades. The Dunwoody Institute offers this material to industry at cost.

* * *

The building of ships for the war meant more than just building ships. In connection with the shipbuilding program, 36,000 dwelling units were built in congested shipbuilding centers by the Maritime Commission at a cost of $40,000,000.

Present-Day Brazing Production Possibilities

(Continued from page 148)

Another application of interest to the production engineer, although it does not involve production brazing of parts, is in the fabrication and repair of tools by brazing. This technique was a veritable lifesaver for the production man in days when new tools were unobtainable. Two separate applications will be described here, the first being the brazing of tools from several component parts, and the second, the reclamation of cracked and broken tools by brazing.

Typical of the first case is the application of carbide tips to tool shanks. At the left in Fig. 11 are shown the component parts, consisting of the tool shank, the carbide tip, and the strip alloy, cut to size and shape in two pieces for pre-placement. The alloy in this instance is the silver-copper-cadmium-zinc-nickel composition.

After preparing the tool shank to the desired shape to receive the tip, it is thoroughly cleaned with carbon tetrachloride or similar solvent. Next, the carbide tip is ground along the faces to be brazed, so as to remove the skin and foreign matter. Following this, flux is applied to the shank, tip, and alloy, and the parts are assembled. Heating is usually accomplished with an oxy-acetylene torch, except when large numbers of tips are brazed, in which case heating is performed in a furnace. Generally, the tip and alloy are held in place by a steel rod during heating.

When the alloy is molten, the tip is given a sliding motion to insure "wetting" of the alloy on all surfaces. When the heating is performed in a furnace, the tip, alloy, and shank are bound together with a wire of heat-resisting alloy. The same technique may be employed for fabricating inserted-tooth cutters and other tipped tools. In addition, short sections of tool steels can be joined to sections of ordinary steel, thus enabling the tool steel to be used down to the smallest possible piece.

The reclamation of broken tools by brazing is usually performed with the lower melting-point alloy, although under some circumstances it is desirable to use the higher melting-point composition containing nickel. The list of tools that can be salvaged covers almost the entire field—drills, reamers, broaches, milling cutters, saws, etc.

The method of effecting the repair is governed by the type of tool and the nature of the break. The type of steel should also be known, so that it may be determined if any loss in hardness will be encountered in heating to 1200 degrees F. for making the braze. If the break is clean and flat, strip alloy may be pre-placed in the fracture. On some broken surfaces, it is possible to cut shallow grooves, say 0.005 inch deep, along one face of the fracture; then when the assembled tool is heated, the alloy is fed in through these grooves. In other instances, the brazing alloy is simply fed into the edge of the break. Another form of pre-placement of the alloy is to "tin" the fractured surfaces prior to assembly for final heating.

The repair of the 8-inch milling cutter shown in Fig. 12 will serve to illustrate the principles of this operation. After being cleaned in carbon tetrachloride, the surfaces of the fracture were coated with brazing flux and tinned with alloy in the manner shown in Fig. 13. Following this, the cutter was assembled, which was relatively simple because the fractures were such that the parts were virtually self-aligning.

The assembled cutter was then heated, as shown in Fig. 14, by starting on the heavy hub section and subsequently transferring the heat to the lighter tooth sections. The completed job is shown in Fig. 15, from which the fine line of the braze is apparent. Upon checking, it was found that the cutter was only 0.012 inch out of line, and this was corrected by regrinding.

Proof of the success of this repair job is found in the production record of the repaired tool. In the short space of several months, it was used for milling twelve eight-tooth pinions with a 4 1/2-inch face, and no sign of failure developed. The economy of this type of repair is self-evident.

The brazing operations here outlined, which were mainly developed under wartime conditions, indicate the wide possibilities of the process when the country once more returns to the fabrication of peacetime products.

* * *

New Technical Films on Plastics

Two new films on Bakelite plastics have been brought out by the Bakelite Corporation, New York City. The first one deals with the selection of the right thermosetting molding material, and the second with product design and molding technique for thermosetting plastics. These motion pictures are intended to serve as training films for engineering students and plant personnel. Sixteen-millimeter prints of these films are available without cost to executives, industrial organizations, engineers, designers, and educational institutions upon request to the Technical Film Library, Bakelite Corporation, Unit of Union Carbide and Carbon Corporation, 300 Madison Ave., New York 17, N. Y.

Engineering News

Unusual Developments in the Internal Combustion Engine Field

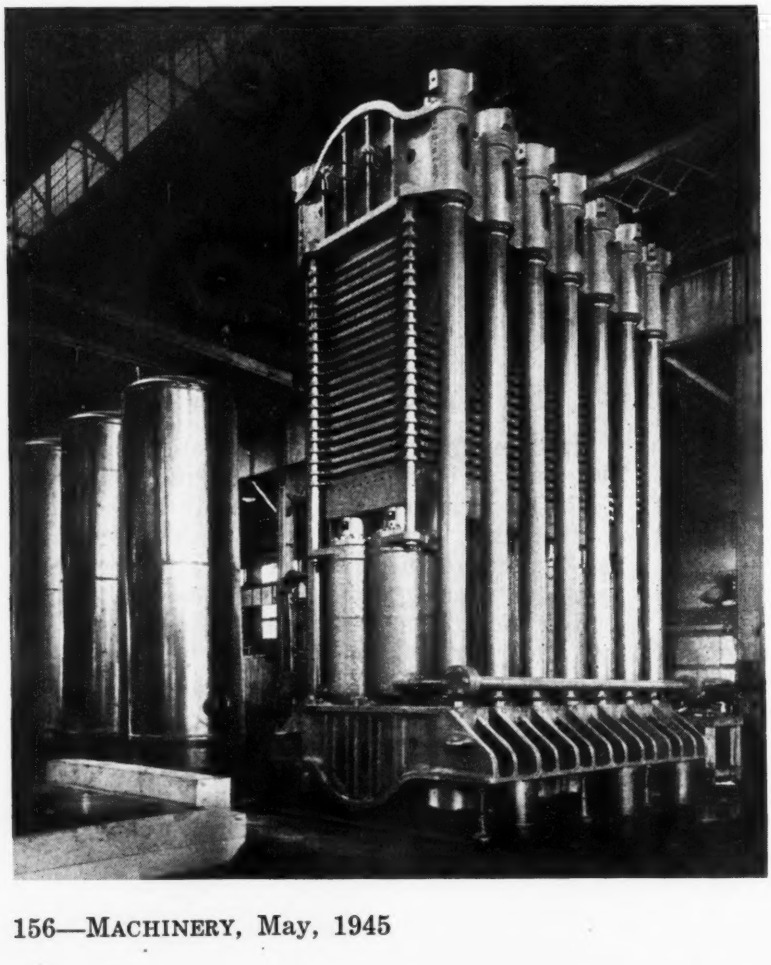
An engine capable of instantaneous conversion from oil to gas fuel without change in load or speed is now in production at the Buffalo Works of the Worthington Pump & Machinery Corporation. Conversion from one fuel to another or adjustment for a combination of both is accomplished by one revolution of a single control wheel. Tests made indicate that the new engine operates successfully. The first installation is already in use in a large municipal power plant. Regardless of the fuel being used, the engine operates on the Diesel cycle, thus realizing fuel economies heretofore unobtainable in gas-engine operation.

A similar development, which enables an engine to operate on either gas or oil as a fuel, is announced by the Cooper-Bessemer Corporation, Mount Vernon, Ohio. With this new development, the fuel consumption of gas engines may be cut from 20 to 25 per cent. The unit is able to operate on a wide variety of fuels, including fuel oil, natural gas, manufactured and coke oven gases, and refinery by-products. The conversion from liquid to gas fuel consists simply of closing one valve and opening another, with the engine operating continuously at full load. Although conversion from one fuel to another has been possible in the past, it was necessary to shut down and exchange some parts of the engine. This engine also operates on the Diesel principle.

Insulated Mounting Bushings Impervious to Oil

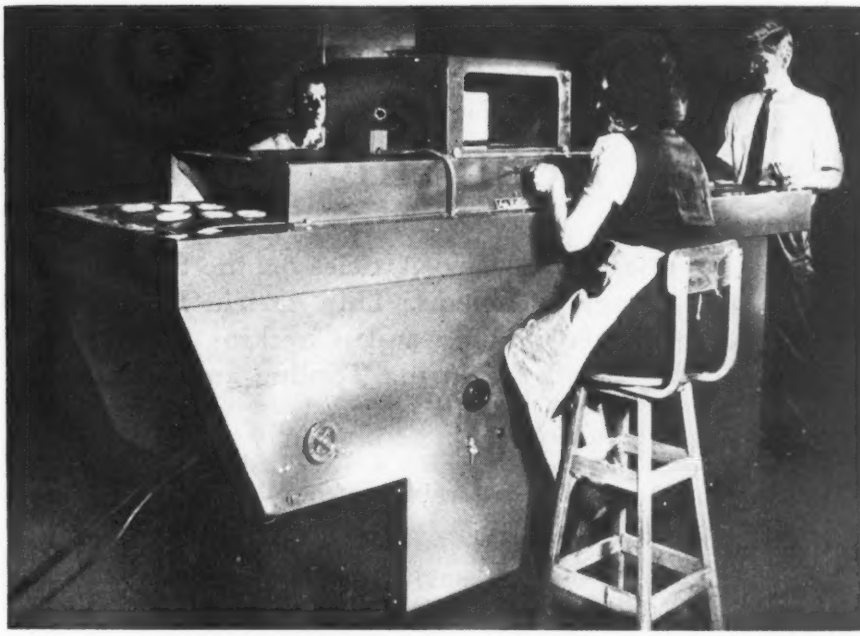
Mountings of synthetic rubber, used in the assembly of aircraft, which have a high rate of vibration and shock absorption, and, in addition, are impervious to decomposition by oil, have been added to the line of insulated bushings and mountings made by Bushings, Inc., 3442 W. Eleven Mile Road, Berkley, Mich.

Another important feature of these bushings is their resistance to heat. The reason for this is that the assembly of the inner and outer metal shells with synthetic rubber is accomplished without vulcanizing. In other words, the bond between the metals and the synthetic material is a mechanical rather than a chemical bond. Thus heat does not affect the mounting until very high temperatures are reached. Another important point is that the elements of the assembly do not have to be cylindrical or symmetrical, since the method of manufacturing these insulated bushings and mountings can be employed satisfactorily with parts of virtually any size or shape. Practically any combination of rubber with plastics, wood, steel, brass, powdered bearing materials, etc., is made possible by the new process.



A Giant Forming Press Built by the Southwark Division of the Baldwin Locomotive Works. This Press Weighs 1,250,000 Pounds. It has Fourteen Hydraulic Cylinders with a 6-foot Stroke. It is Built to Form Fiberboard under Intense Heat and a Pressure of 9500 Tons

A New Type of Inspection Instrument—A Conveyor Type X-ray Fluoroscope that Inspects Moving Objects. Operators can be Placed on One or Both Sides of the Device Viewing the Objects to be Inspected through the Indirect Fluoroscopic Head. Defective Pieces can be Marked without Stopping the Conveyor. This Equipment was Developed by the North American Philips Co., Inc., New York



Refrigerating a Hangar for Superfortresses

Probably the largest single refrigerated space in the world will shortly be in operation at one of the Army's southern proving grounds where Superfortresses will be subjected to extreme temperatures. The inside dimensions of the hangar are 200 feet long, 250 feet wide, and 70 feet high. From a central control board, engineers will be able to obtain temperatures of from 70 degrees F. below to 165 degrees F. above zero. It will take two days to reduce the temperature from 90 degrees F. above to 70 degrees F. below zero. The sub-zero refrigeration system has been designed by the York Corporation, and has a capacity equivalent to that of cooling 700 average-sized homes.

One of the major tests in the hangar will be to determine how readily a plane can be started in extremely cold weather. The effect of temperature variations on superchargers used in stratosphere flying, and on heaters, gas lines, and tanks, as well as on lubricants and fuels, will be studied. At very low temperatures, for example, gasoline becomes sluggish and eventually freezes, lubricants stiffen, and rubber becomes brittle.

Tiny self-propelled cars completely enclosed in glass will carry their own miniature air-conditioning systems to protect observers working inside the hangar against the extreme temperatures and humidities at which the tests are conducted. It is expected that the temperatures within the hangar may be controlled within 2.5 degrees of the basic temperature desired.

Attached to the main hangar is a smaller cold chamber, 80 feet long by 25 feet wide by 25 feet high, which will have the same range of temperatures as the hangar, for testing various types of aircraft engines when the testing of a whole plane assembly is not necessary. Cork insulation and hermetically sealed doors will minimize the effect of the outside temperature.

Moisture in Wood and Other Materials Determined by Simple Device

A new detector, which is the result of many years of development work, is now available through the Colloid Equipment Co., Inc., 50 Church St., New York City, for determining in a simple way the moisture content of wood, plaster, and many other materials. This instrument, which is wholly self-contained, is used simply by forcing the electrode needles with which it is provided into the material being tested, and then reading off the percentage of moisture directly on a dial. The reading is taken by simply turning the dial knob until a small light above the dial flashes.

Cost-Saving Application of Powdered Metal

The cost-saving advantages of powder metallurgy are well illustrated in the case of the manufacture of seals for airplane fuel pumps from bronze powder. These seals, made by the Powder Metal Parts Division of the Keystone Carbon Co., St. Marys, Pa., are manufactured at about one-tenth the former cost, when the seals were produced by casting, milling, drilling, and slotting operations. In addition, it is stated that closer tolerances can be maintained continuously while, at the same time, stepping up production.

Quantity Production and Checking of Parts Requiring Compound Angles

Second of Two Articles on the Solution of Compound-Angle Problems. This Article Deals with Computing, Dimensioning, and Checking of Compound Angles during Tooling and Inspection

By FREDERICK W. PLAPP, Special Tool Engineer
The Denison Engineering Co., Columbus, Ohio

WHENEVER compound angles are met with in tooling, they are usually a source of difficulty. This is especially true in the aircraft industry, where engineering requirements for incidence, dihedral, sweep, stress member location, and air-foil contour result in a prevalence of compound angles in production parts and assemblies.

It has been the writer's experience that the difficulties encountered in producing compound angles are largely due to incomplete information being supplied on the working drawings and to a lack of understanding on the part of those who must produce and inspect the various parts in which compound angles occur. The engineering drawing is often vague, and there is a regrettable tendency toward indefinite angle evaluation, especially on drawings of parts that are dependent on mold loft determination. The tool designer and sub-contractor do not fully understand compound angles, and the tool inspector and receiving inspector do not know how to check them accurately; consequently, trouble is experienced in both production and inspection.

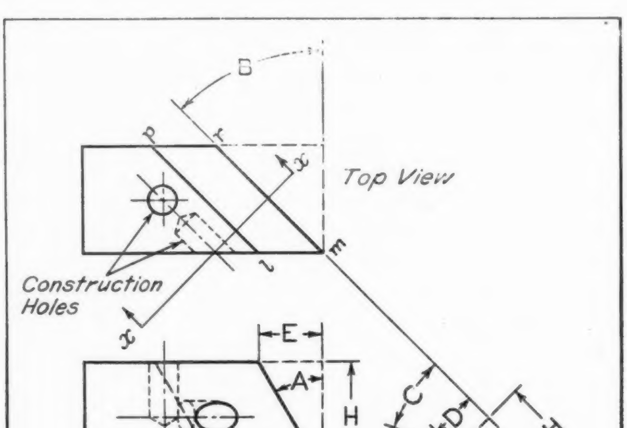


Fig. 1. Top and Side Views of Compound-angle Block which Show that Component Angles A and B Only are Insufficient for Accurate Machining and Checking. Addition of Two Construction Pin Holes and View x–x Showing Compound Angle C Fulfills the Requirements

It is believed that the following method of computing, dimensioning, and checking compound angles will largely eliminate the difficulties mentioned. This method is based on two elements: (1) A clear, understandable drawing with auxiliary views that show all the necessary information about the compound angles involved; (2) a *master part* which is used for (a) making a fixture, die, or jig to facilitate the accurate machining of the required parts during production, and (b) checking the location and size of the compound angles in the inspection of these parts.

This method meets the requirements of quantity production in that it provides a rapid method of production tooling and a sure and speedy means of inspecting all manner of parts, whether tooled or not.

In Fig. 1 is shown a compound-angle block with two given angles *A* and *B* in planes normal to each other. Too often, a working drawing of this block would contain only the top and side views with the values of angles *A* and *B* given. The value of the compound angle *C*, the construction pin holes, and the view *x–x* would not be shown.

The writer's experience has been that in shop after shop both machinists and inspectors alike, if given such a drawing, would confess their inability to quickly produce or inspect this block. The shop procedure would probably be to lay out angles *A* and *B* on the respective faces of the block and then, by trial and error, endeavor

to approximate the compound-angle surface required. The inspectors would have great difficulty in determining (a) if the compound angle so obtained were correct; and (b) if the compound-angle plane passed through the correct points on the block.

In Fig. 1, *prml* is the compound-angle plane and the compound angle is the angle which this plane makes with a plane passing through *rm* and at right angles to the bottom of the block. The two sides of the compound angle lie, respectively, in these two planes and are at right angles to the line of intersection *rm* of these two planes. Then, x–x at right angles to *rm* is the plane in which the compound angle is measured, and view x–x shows the true size of this angle C. Angles A and B are components of this compound angle C.

As was explained in the previous article on compound angles, published in March MACHINERY, the value of angle C in this type of compound-angle problem may be computed by the formula:

Tangent of compound angle = cosine of angle of rotation × tangent of normal angle

The angle of rotation is that component angle, one side of which is the intersection of the two planes forming the compound angle. The other component angle is the normal angle, that is, it lies in a plane normal to the plane of the angle of rotation. Hence, in Fig. 1, angle B is the angle of rotation, and angle A is the normal angle, and

$$\text{Tan } C = \cos B \times \tan A$$

The derivation of this formula is as follows:

$$\text{Tan } C = \frac{D}{H}$$

But

$$D = E \cos B \qquad \text{and} \qquad E = H \tan A$$

Therefore,

$$\text{Tan } C = \frac{H \tan A \times \cos B}{H} = \tan A \times \cos B$$

When the third view x–x is added to the drawing, the procedure of setting up the block for machining becomes relatively simple. If the block is to be faced off with a milling cutter, the problem of positioning resolves itself into two requirements: (1) To place the block in such a position that the plane to be cut will coincide with the plane in which the cutter or grinding wheel will be traversed for the finishing cut; (2) to place the block in such a position that the finishing cut will be taken at some specified distance from a given reference point on the block. (In some cases, where the exact position of the compound plane is not important, only the first requirement need be met.)

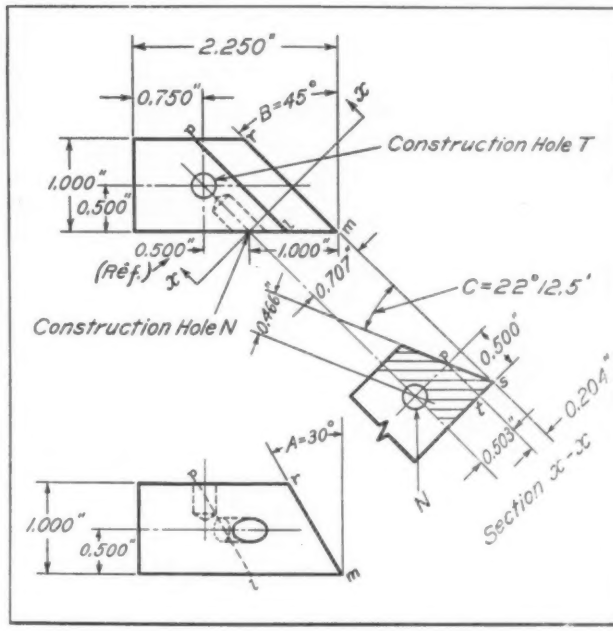


Fig. 2. A Compound-angle Block Problem Showing Given and Computed Linear and Angular Dimensions Needed for Accurate Machining and Checking

Suppose that the compound-angle block shown in Fig. 2 were to be produced. The component angle A is 30 degrees and B is 45 degrees; then,

$$\begin{aligned} \text{Tan } C &= \cos B \times \tan A \\ &= 0.70711 \times 0.57735 \\ &= 0.40825 \\ C &= 22 \text{ degrees } 12.5 \text{ minutes} \end{aligned}$$

If a single block were to be produced, and, as shown in Fig. 3, an adjustable angle-plate were used to support it for milling, it would be positioned as follows: The block would be placed on the plate with that face which is at right angles to one side of the compound angle (in Fig. 3, it is the bottom of the block) resting on the plate, and with the side of the block in the plane of which the normal angle A is measured, at right angles to the hinge-pin about which the angle-plate rotates. The block is then rotated on the surface of the angle-plate through the angle of rotation B, or 45 degrees, so that when the compound-angle plane is machined, its intersection with the bottom plane *rm* of the block will be parallel to the hinge-pin.

After fastening the block in this position, the angle-plate itself is swung about the hinge-pin through the compound angle C, or 22 degrees 12.5 minutes, so that the compound-angle plane is now parallel to the horizontal plane through which the cutter is to be traversed.

If the part to be produced were a lathe tool, in which the exact location of the compound-angle plane with relation to the end of the block was not important, the above procedure would

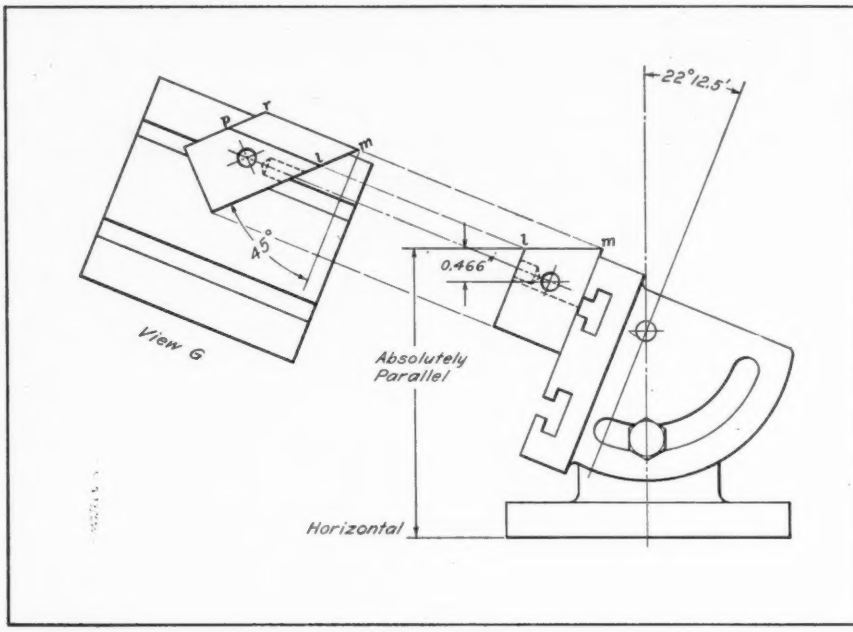


Fig. 3. Showing how Compound-angle Block in Fig. 2 is Mounted on Angle-plate and Angle-plate is Positioned for Machining Compound-angle Face

be adequate. If, however, a precision part is to be produced in considerable quantity with the compound-angle plane passing through a specified point, some means for quick and accurate set-up and inspection must be provided. The use of an accurately made master part, with locating holes or pins from which exact measurements can be readily taken, meets this need.

To take a specific example, suppose that the part shown in Fig. 2 is to be produced in quantity. The compound angle is to be 22 degrees 12.5 minutes, and the compound-angle plane must pass through a point m at a distance of 2.250 inches from the square end. In producing a master part for this piece, a construction hole T for a locating pin is drilled in the top of the block at any convenient distance from the square end and with its axis at right angles to the bottom of the block. A second hole N for another locating pin is drilled in the front side of the block with its axis parallel to rm and passing through the axis of hole T. The axis of this hole will then be parallel with the finished compound-angle surface.

From the diagram in Fig. 2, it can be seen that if the center of hole T is located 0.500 inch from the side of the block in which hole N is drilled, the center of hole N will be 0.500 inch (reference) from a line drawn through the center of hole T and at right angles to the front edge (equal sides of a 45-degree triangle), and the horizontal distance of the center of hole N from point m can be readily computed.

Thus, in the diagram, hole T is 0.750 inch from the end of the block; hence the horizontal distance of the center of hole N from point m is equal to $2.250 - 0.750 - 0.500 = 1.000$ inch. The horizontal distance from hole N to point m, as measured in the compound-angle plane, view x–x, would then be $1.000 \times \sin 45$ degrees $= 1.000 \times 0.707 = 0.707$ inch.

The distance ts in this view is equal to $0.500 \times \tan C = 0.500 \times \tan 22$ degrees 12.5 minutes $= 0.500 \times 0.408 = 0.204$ inch. The distance from hole N to point p in the same view then equals $0.707 - 0.204 = 0.503$ inch. The distance from hole N to the compound-angle surface, measured along a line drawn through the axis of hole N and at right angles to the compound-angle plane, is equal to $0.503 \times \cos C = 0.503 \times 0.92583 = 0.466$.

In checking the accuracy of the locating holes, pins are inserted in them and the master block is set up on an angle-plate, similar to that shown in Fig. 3, with the face of the plate in a vertical position. If the block is rotated from its initial position on the angle-plate through the angle of rotation B, which is 45 degrees, as shown in view G, but with the face of the angle-plate still in a vertical position, the centers of the pins in holes T and N should be at the same height from the horizontal reference surface on which the base of the angle-plate rests. If height-gage readings to these pins are the same, then the center lines of these two holes intersect as intended.

If the master block is now tilted on the angle-plate through the compound angle, and the compound-angle surface is ground down to the point where measurements from pin N indicate that the surface is exactly 0.466 inch above the center line of the pin at all points, then the master block will have been accurately made and it will be ready for use in production and inspection operations.

For the production set-up, if no special fixture were made, the master block would be affixed on the angle-plate in the correct position and the angle-plate would be tilted to the compound angle. Guides would be affixed to the angle-plate in such a way that blanks to be machined could be placed exactly in the correct position for machining. If the compound-angle surface were to be ground, the master block could be used to locate the down-feed stop on the grinding wheel.

When used for inspection, the master block would be positioned accurately on the angle-plate and the angle-plate tilted to the compound angle. A height gage would then be used to determine the distance of the compound-angle plane on this master block above the horizontal reference plane. Suitable guides would, of course, be affixed to the angle-plate to hold the finished pieces in exactly the same position as the master block. The reference measurement thus established would be used for checking a sufficient number of points on the compound-angle plane of each finished piece to establish the accuracy of its location.

In the example just considered, construction holes were used in the master part to provide a means of accurately checking the size of the compound angle and the location of the compound-angle plane. It was shown how this master part could be used (a) to facilitate an accurate production set-up and (b) to provide a means for accurate inspection.

In the next example, it will be shown how construction holes are used in a sub-base angle-plate, which is used to support the work-piece in the correct position for machining the compound-angle plane, and also in the work-piece or master part itself to facilitate accurate machining and rapid inspection.

In Fig. 4 is shown an airplane-wing hinge forging which is to be machined for the insertion of cap strips or spars. As shown in this illustration, at some distance d from the upper locating hole Q, a cross-sectional view x–x calls for a cut at 5 degrees from horizontal to be made at a distance of 7.500 inches from the root chord plane. The compound angle lies in plane z–z, which is at right angles to y–y. As shown in cross-sectional view z–z, line y–y is the intersection of the two planes which form the compound angle. Since y–y forms one side of angle B, this is the angle of rotation and A is the normal angle. The formula for the compound angle C is:

$$\text{Tan}\, C = \cos B \times \tan A$$

The value of angle C can now be determined by substituting the values given in Fig. 4 for angles A and B as follows:

$$\begin{aligned} \text{Tan}\, C &= \cos 10 \text{ degrees} \times \tan 5 \text{ degrees} \\ &= 0.98481 \times 0.08749 \\ &= 0.08616 \\ C &= 4 \text{ degrees } 55.5 \text{ minutes} \end{aligned}$$

One way to set up this forging for machining would be to place it flat on a machine table, so that the root chord plane is parallel to the plane in which the cutting tool or grinding wheel is traversed. The forging is then rotated through angle B, bringing y–y into a parallel position with the cutting tool or grinding wheel plane of traverse. The forging is then tilted through the compound angle C, thus bringing the compound-angle plane into a vertical position ready for machining.

To hold the forging in the correct tilted position for machining—that is, at angle C with the horizontal—a sub-base would be required. The next problem is, then, to compute the dimensions of the sub-base for this purpose.

Starting with a rectangular block, a construction hole G is bored at some suitable distance from the bottom edge, say, 0.500 inch, as shown in Fig. 5. A second construction hole H is bored at the same distance from the bottom edge and at some convenient distance, say, 5.000 inches from hole G. These two holes can now be used to locate the sub-base on the machine table so that its top face can be machined exactly to angle C with the bottom face. This is done by raising one end, so that hole G is at a vertical distance of 5.000 × sin C above hole H. When this is done, the block will be in the proper posi-

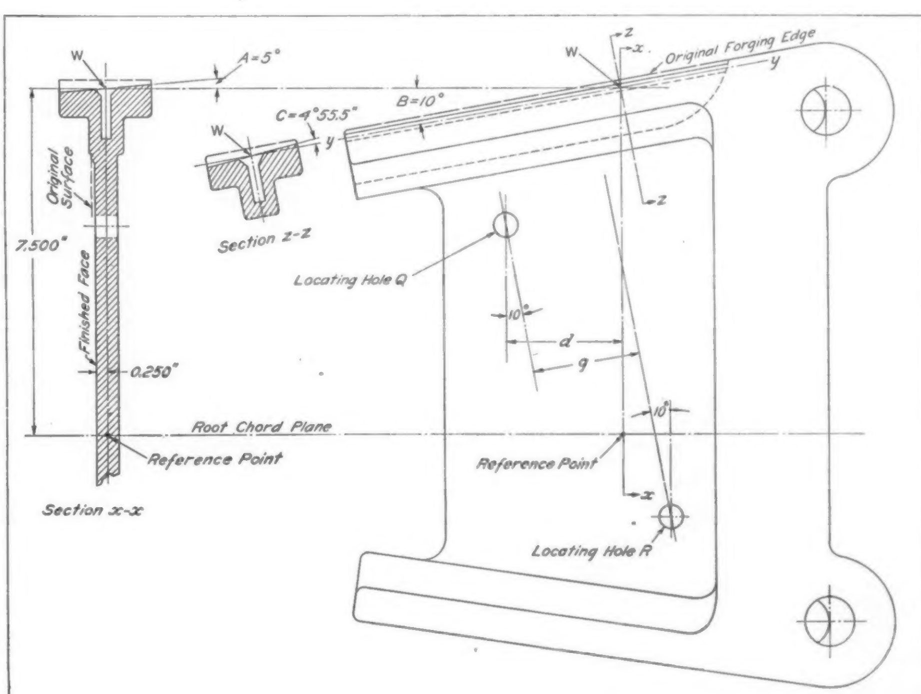


Fig. 4. Airplane-wing Hinge Forging, Showing Compound-angle Surface to be Machined

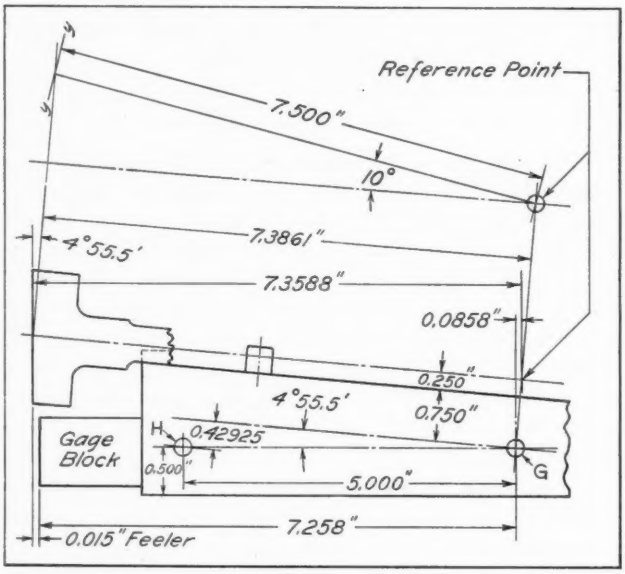


Fig. 5. Wing-hinge Forging in Fig. 4 is Shown Here Located on Sub-base Angle-plate, Ready for Machining. Construction Pin Holes Facilitate Alignment for Machining, and Checking of Finished Compound-angle Surface

tion for machining. Let this distance be designated as m; then,

$$m = 5.000 \times \sin 4 \text{ degrees } 55.5 \text{ minutes} = 5.000 \times 0.08585 = 0.42925$$

To show how accurately this angle can be obtained by using the distance m to locate the face for machining, it should be noted that:

$5.000 \times \sin 4$ degrees 55.4 minutes $=$
$5.000 \times 0.08583 = 0.42915$
and $5.000 \times \sin 4$ degrees 55.6 minutes $=$
$5.000 \times 0.08588 = 0.42940$

Hence, a difference of 0.00025 inch in the height of m is required to change the angle by two-tenths of a minute.

Now it must be ascertained how the accuracy of the compound-angle face on the forging can be checked after machining. It will be recalled that the vertical distance from the reference point to the line y–y is to be 7.500 inches, as shown in Fig. 4. When measured at right angles to line y–y, this distance is $7.500 \times \cos 10$ degrees $= 7.500 \times 0.98481 = 7.3861$ inches, as shown in Fig. 5. When measured at right angles to the compound-angle plane, this distance becomes $7.3861 \times \cos 4$ degrees 55.5 minutes $= 0.73861 \times 0.99631 = 7.3588$ inches.

If the sub-base is now placed underneath the forging, so that the reference point is in line with the center of hole G along a line drawn at right angles to the top inclined face of the sub-base, then the horizontal distance from this hole G to the edge of the gage-block shown at the left can be computed as follows: (The distance which the construction hole G is offset from the reference point on the forging along a line drawn at right angles to the compound-angle surface of the forging must first be computed.)

In Fig. 5, the distance between the center of hole G and the reference point on the forging is given as $0.750 + 0.250 = 1.000$ inch. The amount of offset is, therefore, equal to $1.000 \times \sin 4$ degrees 55.5 minutes $= 0.0858$ inch. The distance from construction hole G to the compound-angle plane would then be $7.3588 - 0.0858 = 7.2730$ inches. If a gage-block of sufficient length to permit the use of a 0.015-inch feeler gage in checking the location of the compound-angle plane is used, the edge of this gage-block should be $7.273 - 0.015 = 7.258$ inches from construction hole G when measured at right angles to the compound-angle plane.

In this case, the sub-base angle-plate can be made to perform the function of a master by using it (1) to locate the hinge forging in the correct position for machining, and (2) to provide a means for accurately checking the fin-

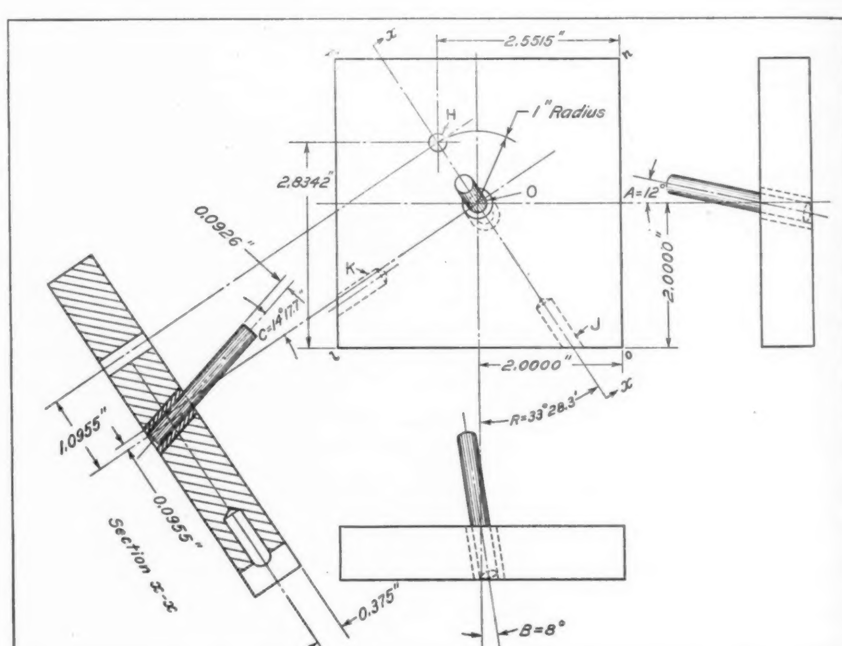
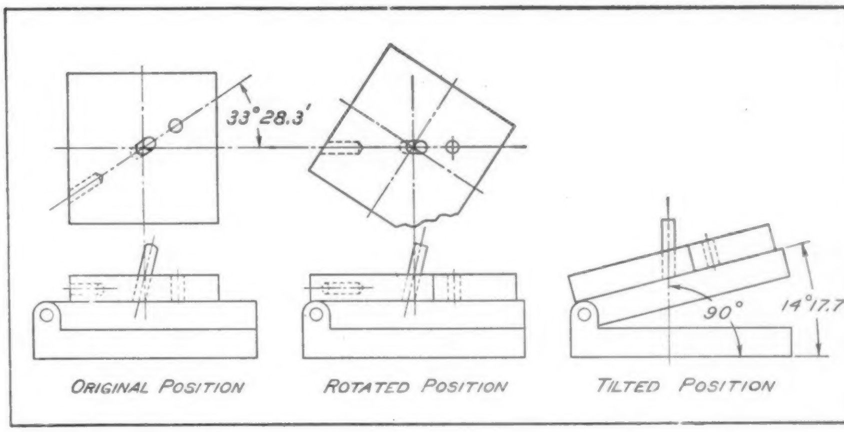


Fig. 6. Machining and Inspection of Hole O for Rod to be Inclined from the Vertical at Compound Angle C are Facilitated by Three Construction Pin Holes

Fig. 7. Showing Original, Rotated, and Tilted Positions in which Block in Fig. 6 is Placed to Bring It into Position for Vertical Drilling and Boring of Compound-angle Hole. (The Supporting Device is Not Shown)



ished forging. The two locating holes Q and R shown in Fig. 4 are utilized later for the beam assembly. They can, however, also be used to locate the wing hinge for machining. If center lines are drawn through these holes at right angles to y–y, they will be at a distance g apart, as shown.

Two pins to fit these holes are placed in the sub-base angle-plate at right angles to the top supporting surface and on center lines that are at right angles to the end surface against which the gage-block rests. (This end surface is parallel to the direction in which the cutter or grinding wheel is to be traversed.) These center lines are at distance g apart, and the pins are so located that when the wing hinge is placed on the sub-base angle-plate, holes Q and R will fit over them and the reference point on the forging will be on a line passing through the center of hole G in the sub-base angle-plate and at right angles to its top surface.

When the hinge forging is placed on the angle-plate in the position determined by the top surface and these two pins, it will be located so that (a) center line y–y will be parallel with the direction in which the cutter or grinding wheel is traversed, and (b) the surface formed by the cutter or grinding wheel will be at an angle of 4 degrees 55.5 minutes with a plane perpendicular to the center line of the forging. For actual production purposes, a jig would be built around a finished forging located on the angle-plate in the position just described.

It may be noted here that it is advisable to use a master bushing plate to set and check the diagonal distance between the locating holes in the primary drill jig which is used for drilling the forgings, as well as in the machining and assembly fixtures.

In Fig. 6 is shown a rod inserted in a plate with the front and side angles of declination A and B given. These are component angles of the compound angle C, which is measured in a vertical plane x–x passing through the center line of the rod. The true size of this compound angle is shown in view x–x.

As explained in the previous article on compound angles, in this type of compound-angle problem the formula for the angle of rotation R, when measured from a plane parallel to that of angle A, and the formula for the compound angle C, in terms of the component angles A and B, are as follows:

$$\text{Tan } R = \frac{\tan B}{\tan A}$$

$$\text{Tan } C = \sqrt{\tan^2 A + \tan^2 B}$$

In Fig. 6, angle $A = 12$ degrees and $B = 8$ degrees; therefore,

$$\text{Tan } R = \frac{\tan 8 \text{ deg.}}{\tan 12 \text{ deg.}} = \frac{0.14054}{0.21256} = 0.66118$$

$$R = 33 \text{ degrees } 28.3 \text{ minutes}$$

$$\text{Tan } C = \sqrt{\tan^2 8 \text{ deg.} + \tan^2 12 \text{ deg.}}$$

$$= \sqrt{0.14054^2 + 0.21256^2}$$

$$= \sqrt{0.01975 + 0.04518}$$

$$= \sqrt{0.06493} = 0.25481$$

$$C = 14 \text{ degrees } 17.7 \text{ minutes}$$

In making this master, construction holes are used to provide for the accurate positioning of the block for drilling and boring the center hole O and for checking the accuracy of the location of this hole in the master. The master, itself, is used to facilitate the construction of a jig or fixture for the production operation and to provide a means of checking the location and angularity of the rod hole in the finished parts.

Referring still to Fig. 6, construction hole H is bored at some convenient radius, say 1 inch, from the center of the plate; at right angles to the top surface; and at angle R from the vertical center line of the top view, as shown. The horizontal distance of the center of hole H from the right-hand side of the plate is, therefore, $1 \times \sin 33$ degrees 28.3 minutes $+ 2.0000 = 2.5515$ inches, and the vertical distance of the center

of hole H from the front edge of the plate is, therefore, $1 \times \cos 33$ degrees 28.3 minutes $+ 2.0000 = 2.8342$ inches. The master plate is, then, located with sides *ml* and *no* parallel to the axis of the machine spindle, and with the center of hole H on the center line of the spindle. The plate is now swung through angle R with hole H as a center, and hole J is drilled and bored and a pin inserted. The center line of hole J will then pass through the center of the rod hole O, which is still to be drilled and bored, and also through the center of hole H.

If the master plate is now placed on an angle-plate so that the axis of holes J and H is at right angles to the hinge axis of the angle-plate as shown in Fig. 7 (rotated position), and the angle-plate is inclined to the horizontal at the compound angle $C = 14$ degrees 17.7 minutes, then it will be in position for drilling the rod hole O. In order to locate hole O accurately, another construction hole K, Fig. 6, is drilled at right angles to the axis of hole J and at such distance from H as will cause its center line to intersect the center line of rod hole O. The distance between the center line of hole K and a line drawn parallel to it through hole H is equal to $1 + 0.375 \times \tan C$, where 0.375 is the vertical distance of the center of hole K from the top of the block. Then

$$1 + 0.375 \tan C = 1 + 0.375 \times 0.25481$$
$$= 1.0955 \text{ inches}$$

The position of hole O is then located from pins inserted in H and K, and after drilling and boring, a bushing is provided for accurate location of the boring spindle in the production set-up. The master can be checked by placing edge *on* against a vertical plate and then rotating it through angle R as determined by a sine bar or some other accurate means. The vertical distance of the centers of pins H and J above the horizontal base plane should be the same. The 1.0955-inch distance of the center line of hole K from the center line of hole H can be checked directly with a height gage if the plate is mounted with the center line which passes through holes H, O, and J in a vertical position.

The production set-up is made by building a jig around the master when located in the tilted position shown in Fig. 7. The master can be used to check the jig and also to facilitate an inspection set-up of the finished work-pieces. A fixture can be built to hold the master or work-piece in the tilted position shown in the illustration. A guided pin is then so located as to slide easily into rod hole O of the master. When a work-piece is placed in this fixture, the insertion of this guided pin can be used to check the correct location and angularity of the rod hole.

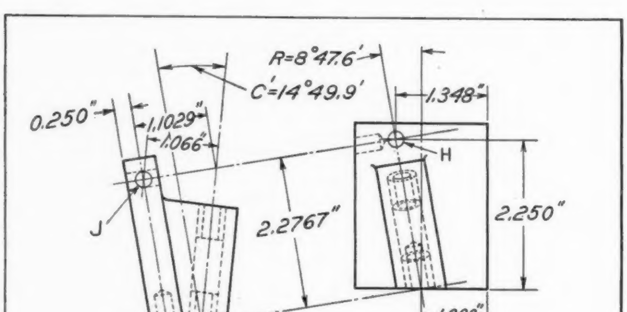


Fig. 8. Compound-angle Hole in This Bracket is Readily Machined and Checked for Angularity and Location when Three Construction Pin Holes are Utilized

Fig. 8 shows a typical compound-angle hole drilled in a bracket. The drilling of this hole is essentially a compound-angle problem of the same type as the one just discussed. In this case, however, the compound angles A' and B' are measured from the horizontal instead of from the vertical. The equations for R and C used in the problem just discussed can be applied to this problem, if the component angles of declination from the vertical (complements of A' and B') are substituted in the two formulas.

If $A = 90$ degrees $- A'$ and $B = 90$ degrees $- B'$, then since angle R is measured from a plane parallel to that of angle A,

$$\operatorname{Tan} R = \frac{\tan B}{\tan A}$$

The formula for the compound angle of declination C is:

$$\operatorname{Tan} C = \sqrt{\tan^2 A + \tan^2 B}$$

According to Fig. 8, $A' = 15$ degrees and $B' = 60$ degrees; hence, $A = 90$ deg. $- 15$ deg. $= 75$ deg. and $B = 90$ deg. $- 60$ deg. $= 30$ degrees

$$\operatorname{Tan} R = \frac{0.57735}{3.7320} = 0.15470$$

$$R = 8 \text{ degrees } 47.6 \text{ minutes}$$
$$\operatorname{Tan} C = \sqrt{3.7320^2 + 0.57735^2}$$
$$= \sqrt{13.9278 + 0.3333}$$
$$= \sqrt{14.2611}$$
$$= 3.7764$$
$$C = 75 \text{ degrees } 10.1 \text{ minutes}$$

The angle of elevation from the horizontal C' is equal to 90 degrees — 75 degrees 10.1 minutes, or 14 degrees 49.9 minutes.

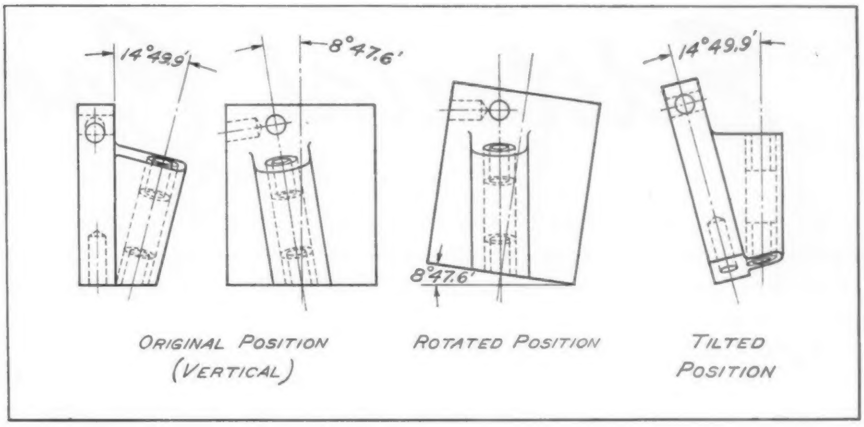


Fig. 9. Showing Original, Rotated, and Tilted Positions in which the Angle Bracket in Fig. 8 is Placed to Bring It into Position for Vertical Boring of Compound-angle Hole. (Supporting Device Not Shown)

As in the previous problem, three construction holes are used. Hole *H* is bored at a nominal 2.250 inches from the front edge of the block. Since it is to be on the center line of the compound-angle hole, it is at a distance of 1.000 + 2.250 tan 8 degrees 47.6 minutes from the right-hand edge. This distance is $1 + 0.348 = 1.348$ inches. The block is then rotated through angle *R* with *H* as a center and hole *K* is bored parallel to the base of the block and with its axis in the same vertical plane as the axis along which the compound-angle hole is to be bored. Hole *J* is bored in the left side of the block parallel to the base and at right angles to the center line of hole *K*, with its center line intersecting the center line of hole *H*.

To place the block in the correct position for boring the compound-angle hole, it is first located vertically in the rotated position, as shown in Fig. 9, and is then tilted through compound angle *C*, placing the block in position for vertical boring of the compound-angle hole. The accuracy of this compound angle can be checked if a pin is inserted in the compound-angle hole and the normal distance between the center of this pin and the center of pin *J* is measured. As shown in Fig. 8, this distance should be 1.066 inches. This distance is computed as follows:

$$2.250 \times \sec 8 \text{ deg. } 47.6 \text{ min.} = 2.250 \times 1.0119 = 2.2767$$

$$2.2767 \times \tan 14 \text{ deg. } 49.9 \text{ min.} = 2.2767 \times 0.26480 = 0.6029$$

$$0.6029 + 0.5000 = 1.1029 \text{ inches}$$

which is the distance from the center line of the compound-angle hole to the center line of pin *J* along the vertical center line of hole *H*. The normal distance from pin *J* to the center line of the compound-angle hole is equal to

$$1.1029 \times \cos 14 \text{ deg. } 49.9 \text{ min.} = 1.1029 \times 0.96668 = 1.066 \text{ inches}$$

Here, again, a production jig can be built around the master when it is located in the tilted position (Fig. 9), and the master can be used to set up an inspection fixture with guided pin to check the compound-angle holes on production parts.

* * *

Three Bills on Patents Introduced in Congress

The National Association of Manufacturers, 14 W. 49th St., New York 20, N. Y., has endorsed three bills on patents recently introduced in Congress by Representative F. W. Boykin of Alabama, chairman of the House Committee on Patents. One of these bills, H.R. 2632, requires the recording of agreements relating to patents. Another bill, H.R. 2630, provides for the public registration of patents available for licensing. The third bill, H.R. 2631, also known as the "Twenty-Year Bill," proposes that a patent shall terminate not more than twenty years after an application has been filed, although the general term of a patent is kept at seventeen years.

Recording of patent agreements is advocated by the National Association of Manufacturers because it would tend to remove the suspicion often attached without justification to perfectly legal and beneficial patent agreements. With regard to the bill for the registration of patents available for licensing, it is believed that this would encourage patent licensing, spread the use of available patents, and tend to remove the cause for charges that available patents are not as widely used as they might be. The Association continues, however, to oppose the suggestion that the Commissioner of Patents should have power to fix the terms and conditions of licenses.

The "Twenty-Year Bill" would correct an abuse which has been evident in some cases—that of purposely prolonging the period of argument in the Patent Office, so that a patent is not issued until many years after the application has been filed. The bill has the effect of retaining the present term of seventeen years for patents, except in those cases where more than three years are consumed in obtaining a patent.

Editorial Comment

There is a great deal of misconception with regard to employment requirements in industry after the war. It has been stated that 57,000,000 jobs will be needed at the end of the war. Such a figure is misleading in many respects. To be sure, that many people are expected to be gainfully employed, but that does not mean that industry, Government, or any other agency will have to provide that many jobs.

Industry will Not Need to Provide All the Post-War Jobs

In these 57,000,000 are included all the farmers, who are self-employed; all the professions —doctors, dentists, clergymen, writers, etc.— who, in the main, are self-employed; and the millions of people who are engaged in business for themselves—from the shoe cobbler and tailor to the owners of great enterprises. Furthermore, 45 per cent of all those gainfully employed find their occupation in rendering services rather than in industry and manufacturing—as in banking, telegraph, telephone, radio, transportation, automobile servicing, and the like.

Only 24 per cent of the job opportunities that must be provided after the war in the United States are in the manufacturing industries, so that of the 57,000,000 gainfully employed, not more than about 14,000,000 will be engaged in manufacturing. In other words, of the 57,000,000 jobs said to be needed, actually industry will not and cannot be expected to provide more than 14,000,000!

It would greatly help to solve the post-war employment problem if more people developed the ability to employ themselves instead of looking to somebody else to create a job for them. There are, for example, endless opportunities in the service fields—opportunities for men to start in small businesses for themselves, rendering services to home owners and business enterprises in the community.

Many Millions of Men Can Provide Their Own Jobs

There are opportunities for qualified men in the repair and maintenance business in all fields. Qualified automobile mechanics, radio mechanics, repairmen for household appliances—to mention only a few instances—are badly needed. There is a scarcity of good men in these fields. To be sure, there may be, in normal times, a surplus of men who are engaged in such work, but many of them are not qualified to handle these services properly. Thousands of men have been thoroughly trained in the armed forces to do such work well, and for them there should be ample opportunities.

In the days of peace to come, when industry returns to its regular channels of production, how can the standard of living of all who work, with hand or brain—in factories and on farms, on railroads and in mines—be raised to an even higher level than in the past?

To answer that question, let us first see what we mean by a "high standard of living." Don't we mean a condition where the majority of our people are able to provide for themselves a plentiful supply of good and wholesome food, attractive homes to live in, sufficient clothing to wear, education for their children, recreational facilities, labor-saving devices for the home—such as washing machines, vacuum cleaners, etc.—and some of the luxuries of life like automobiles, radios, and occasional travel and vacations?

A Higher Standard of Living Calls for More Production

There is one way, and one way only, by which the standard of living can be improved, and that is by greater production per man, through increased efficiency of machinery and working methods and greater personal efficiency of the worker; and it should be noted that this increased efficiency does not necessarily mean harder work. It simply means more thorough and intelligent application to the job. In that way, more commodities, more cheaply produced, can be offered for sale at a price low enough to attract more and more buyers; and this, in turn, will mean more employment, greater competition for the labor available, and higher wages for all. This is the only road to well-being for all the people.

It is unfortunate that so few leaders in public life and in labor circles realize that production —not wages in dollars and cents—determines the standard of living.

Ingenious Mechanical Movements

Mechanisms Selected by Experienced Machine Designers as Typical Examples Applicable in the Construction of Automatic Machines and Other Devices

Reversing Mechanism that Provides for Dwell at Each Reversal

By L. KASPER

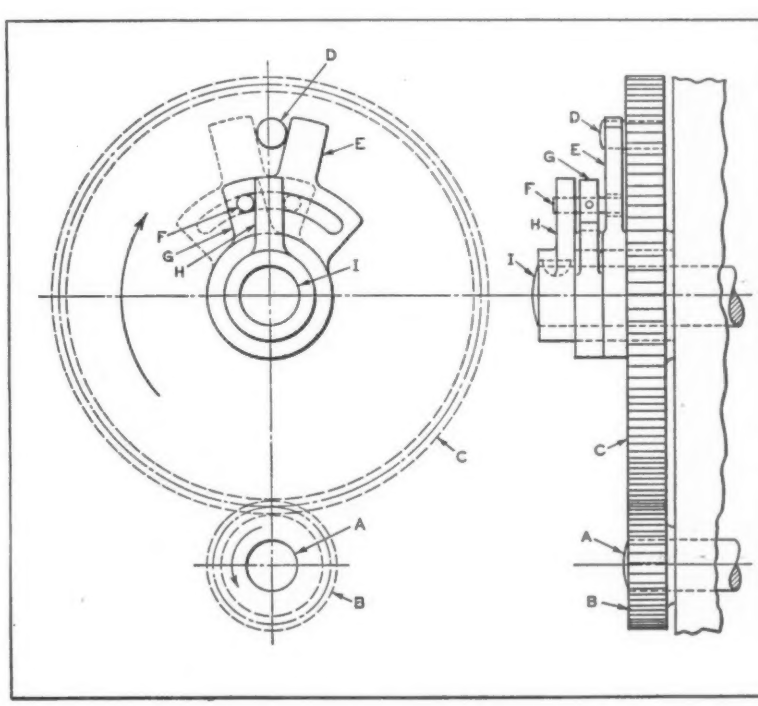
The mechanism here illustrated is used to transmit motion from shaft *A* to shaft *I* in such a manner that when the direction of motion is reversed, there will be a definite, specified lag or dwell in the transmission of the motion to shaft *I*, regardless of the point in the cycle at which the reversal takes place. This mechanism is used on a machine for fabricating a wire product.

Referring to the illustration, shaft *A*, which carries pinion *B* keyed to it, rotates in the direction indicated by the arrow, transmitting motion in the reverse direction to gear *C*, which rotates freely on the hub of the machine member. Gear *C* carries the pin *D*, which comes in contact with the extended arm of the sector *E*, the latter member likewise rotating freely on the hub of the machine member. Lever *G*, which also rotates freely on the same hub, carries the pin *F*, one end of which enters the slot in sector *E*. The opposite end of pin *F* makes contact with the lever *H*, which is keyed to the driven shaft *I*.

In operation, gear *C*, rotating in the direction indicated by the arrow, transmits motion to sector *E* through pin *D*. Sector *E*, in turn, transmits motion to levers *G* and *H* through pin *F*. Lever *H* transmits motion to shaft *I*. On the reversal of the motion, and in one complete revolution of gear *C*, the pin *D* will come in contact with the opposite side of the extended arm of the sector *E*, causing the latter to rotate with gear *C* in a counter-clockwise direction.

When the end of the slot in sector *E* comes in contact with pin *F*, the lever *G* is likewise caused to rotate with gear *C*. On the completion of the second revolution of gear *C*, pin *F* is in contact with the opposite side of lever *H*, the position of the parts at this point being as shown by dotted lines in the illustration. At this point, the shaft *I* begins to rotate in unison with gear *C*.

It will be noted that in order to change the position of pin *F* from one side of lever *H* to the other, two complete revolutions of gear *C* are required, shaft *I* remaining stationary during the cycle. As the ends of the slot in sector *E* control the exact time at which shaft *I* begins to rotate, slight changes in timing can be accomplished to suit different applications by varying the length of this slot.



Gear Drive Mechanism that Provides Dwell for Driven Shaft I at Each Reversal of Driving Shaft A

Automatic Feed for Placing Drawn Shell in Punching Die

By WALLACE C. MILLS

The die shown in the illustration on page 168 was designed for punching the bottom out of a drawn shell of the shape shown by the cross-section view at *S*. The arrangement provided

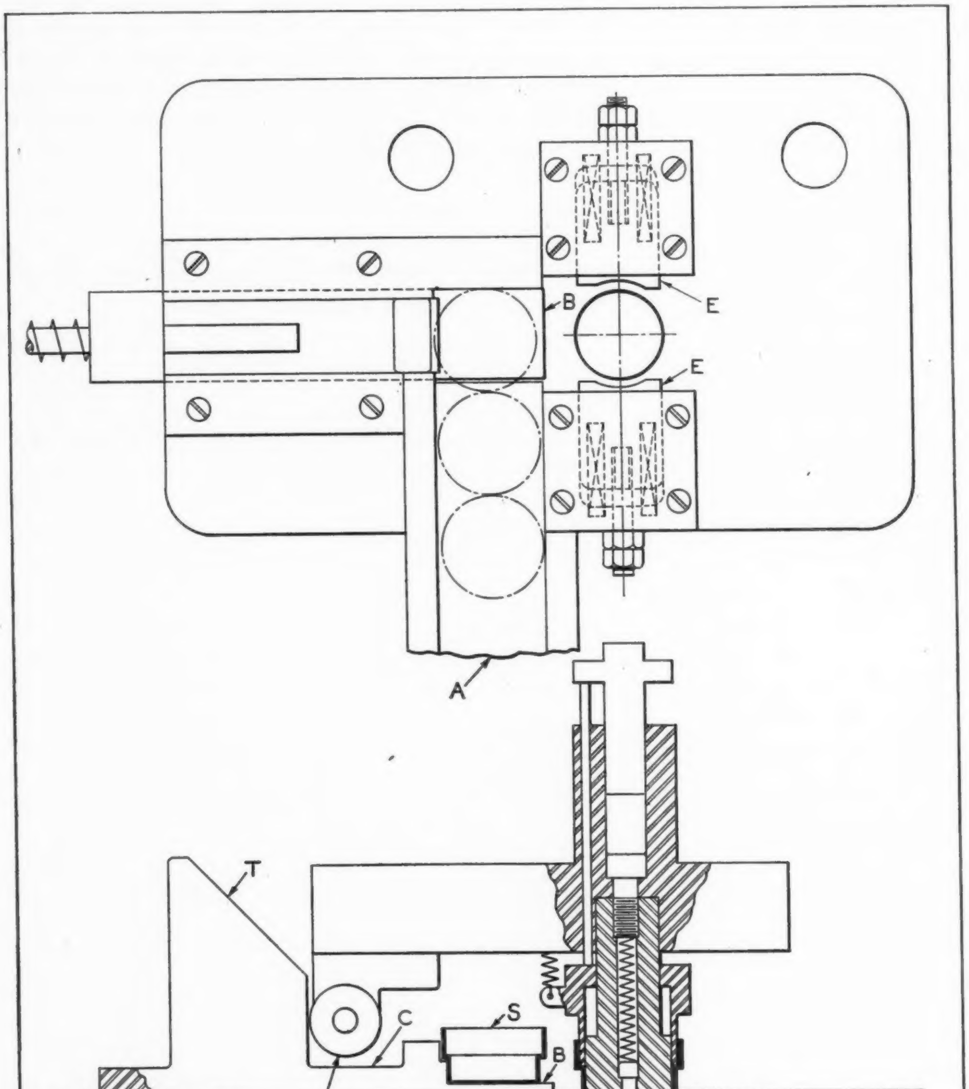
for automatically feeding the shells S to the die resulted in a reduction of spoiled work and trouble from shearing of the punch due to improper location of the work in the die. At the same time, the use of the automatic feed served to increase the production of the die from 1300 to 2400 pieces per hour.

Formerly, the work was pushed down a chute into a locating nest with a stick. Often the work was not in the proper position when the punch came down, with the result that the punch was sheared or dulled. Part of the difficulty was due to the fact that the work would not slide over the hole in the die, which was almost as large as the work, but would come to rest against the side of the hole in a tilted position. Also, the punch would cut into a shell that was just entering the die.

With the automatic feed shown diagrammatically in the illustration, the work is fed into the inclined chute A, from which it slides down on a shelf on slide C, which pushes it between two spring jaws E located over the blanking hole in the die. The slide C, actuated by spring D, carries the shell S under the punch on the upward stroke of the press ram. On the downward stroke, the roller R acting on the cam T moves the slide C outward to the position shown in the illustration, and the punch centers the work, pushes it down onto the die, and punches the hole. The round blank punched out of the bottom of the shell drops through the opening in the die. The work is stripped off the punch on the upward stroke of the ram, and ejected from the die by a blast of air.

The spring action used to push the slide forward prevents jamming in case the work is only half way in the slide when this member starts its forward movement. This happens occasionally when the operator fails to keep the chute filled with shells. The principle on which this lateral feeding mechanism operates can be applied, with certain modifications, to other work. For example, the slide shelf may be omitted when it is unnecessary to carry the work over the die opening.

Obviously, the automatic feed applied to this die makes it much safer to operate. Also, the die can be operated continuously, with less danger of damage to the die or work. The shells can be fed by hand into the chute or a hopper feed can be used. They can also be fed by chute directly from the drawing press.



Die Equipped with Automatic Feed which Locates Drawn Shells under Punch

Basic Principles of Job Evaluation

After the War, Keen Competition, High Labor Costs, and the Need for Harmonious Labor Relations Will Make it More Important than Ever that Management Employ Clear-Cut Methods in Determining Equitable Wage Rates

By ROBERT G. HESS
Director of Wages, Methods, and Budget
The New York Air Brake Co., Watertown, N. Y.

ARE you using job evaluation as part of your company wage administration policy? Every company in the country can answer "yes" to that question. You are using job evaluation if you pay a higher rate for one job than you do for another; if, for example, you recognize by a rate differential that there is a difference between the toolmaker's job and the sweeper's job. The mere fact that someone at some time determined in some manner that the job of the toolmaker was worth more to your company than the job of the sweeper, and, based on this determination, established a higher rate for the toolmaker than for the sweeper indicates that job evaluation was used as a factor in wage administration.

The more important question "Are you using a definite job evaluation plan as part of your company wage administration policy?" cannot be answered "yes" unanimously, even though it is generally recognized that such a plan is a basic requirement for sound wage administration and harmonious labor relations. One primary reason for the lack of definite or formal job evaluation in wage determination is failure on the part of management or labor, or both, to understand what formal job evaluation is and the mutual benefits that can be obtained by its use.

Observations and discussions by certain management representatives and certain union representatives on the subject of formal job evaluation have been both enlightening and confusing. "We don't want anything to do with job evaluation," says a union member of a negotiating committee. "It's just a management device to reduce earnings, and furthermore, we firmly believe that only a doctor is capable of judging the mentality of a person—not a job analyst or an industrial engineer." Yet the same individual, rightfully proud of his job as a first-class machinist, insists that his job is worth more and should command a higher wage rate than the job of running a drill press on repetitive work of a simple nature.

A factory supervisor, talking about job evaluation, remarks, "'Job evaluation'—why that's just another one of those modern theories invented to make life more complicated for the foreman. The foreman has enough headaches without giving him that one too." The same supervisor, during a meeting on wage grievances, says, "There are only a few jobs in that department that are worth a dollar and a quarter an hour, and I will have my foreman determine which ones they are."

One plant manager investigates job evaluation as a means of increasing the rates of his employes, another is disappointed to learn that job evaluation is not a means of cutting over-all earnings that he thinks are too high. A union committee, in negotiating a new agreement, demands four different rate ranges for inspectors, with the lowest range for "beginners," a slightly higher range for "limited inspectors," a still higher one for "departmental inspectors," and top range for "full-fledged inspectors." The same committee members denounce "job evaluation" as an unfair tool of management, not realizing that they themselves have become job analysts and are evaluating jobs.

These contradictory statements and actions indicate but one thing—a definite need for an understanding of formal job evaluation; what it is, how it functions, and what this system can accomplish when it is properly established and administered.

What is Job Evaluation?

The term "job evaluation" refers to the method of determining the relative worth of any number of jobs; or, to express the definition a little differently—it is the way in which we can measure jobs, so that we can say which worker should receive the higher rate of pay and how much higher. We might guess at the relative worth of several jobs, we might use judgment based on experience with those jobs, or we might set up a formal job evaluation plan to insure fairness and consistency in our results.

A formal job evaluation plan is a method of

Chart 1. Evolution of Basic

Compiled by the New York Air Brake Co.,

Job Factors

1. **"Skill"** is the trade knowledge and educational requirements of the job and the mental and physical ability to apply this knowledge to the job.

   1. **"Training"** is the degree to which the job requires basic education and experience.

   2. **"Aptitude"** is the mental and physical talent as required by the job. Such items as accuracy, dexterity, unusual manipulation, the ability to adapt previous experience to new problems, and similar inborn characteristics as required by the job are included in this factor.

2. **"Effort"** is the mental, physical, and visual application demands of the job.

   1. **"Concentration"** refers to the degree of mental or visual application required by the job. It is a measure of the exacting attention demanded by the job.

   2. **"Physical Effort"** relates to the amount of strength or endurance required by the job, or both.

3. **"Responsibility"** is the degree to which the job requires the acceptance of responsibility for product, equipment, and safety of others.

   1. **"Responsibility for Equipment and Materials"** is the extent of possible monetary loss through damage to equipment and materials unless reasonable care is exercised in performing the job.

   2. **"Responsibility for Safety of Others"** measures the extent to which an operator may cause injury to others as a result of a mistake that might easily occur.

4. **"Working Conditions"** involves the inherent factors of the job that make it dangerous or unhealthy and the surrounding conditions that affect the physical or mental well-being of the employe on the job.

   1. **"Unavoidable Hazards"** involve those factors inherent to the job that make it dangerous or unhealthy.

   2. **"Job Conditions" (Supplemental Factor)** refers to the external undesirable surrounding conditions that cause physical discomfort or financial loss to the employe on the job.

Job Factors and Definitions

Industrial Engineering Department

1. **"Basic Education"** is the degree to which the job requires the use of formal education (or its equivalent in practical experience).	Basic Education—measured in terms of formal education.
2. **"Experience"** involves the background in methods and the use of equipment and materials as required by the job, and is reflected by the length of training time required to perform the job in a satisfactory manner. This means the total time required on previous qualifying jobs plus the time on the job in question.	Experience—measured in terms of length of training.
1. **"Mental Capability"** is the extent to which versatility and ingenuity are required by the job.	Versatility—measured in terms of variety of types of work and complexity of work. Ingenuity—measured by the degree of inventiveness required.
2. **"Judgment and Initiative"** is the degree to which decision and aggressiveness are required by the job.	Judgment—measured by the difficulty of decisions required. Initiative—measured by the degree of aggressiveness required to put into action the decisions made.
3. **"Physical Skill"** is the degree to which it is necessary to control any of the physical senses in performing the operation.	Precision—measured by the closeness of limits or degree of accuracy required. Dexterity—measured by the degree of speed of motion, nimbleness, or rhythm required.
....	Visual Concentration—measured by the degree of eye strain required by the job. Mental Concentration—measured by the degree of mental strain required by the job.
....	Strength—measured in pounds of force exerted. Endurance—measured in terms of the degree of exertion sustained.
....	Responsibility for Equipment—measured in terms of possible dollar value damage. Responsibility for Material—measured in terms of possible dollar value loss.
....	Responsibility for Safety of Others—measured in terms of possibility and extent of injury to fellow workmen.
....	Health Hazards—measured by the degree of probability and severity of detrimental effect on health. Accident Hazards—measured by the frequency of exposure, probability and severity of an accident on the job.
....	Discomfort—measured by the degree of heat, cold, noise, dirt, smoke, etc. Clothing Spoilage—measured by the degree of wear experienced.

job analysis based on facts, and established for the purpose of measuring the worth of one job as compared with any other. This method of job analysis takes apart or breaks down a job into its basic components or factors and provides a means of measuring the amount of each factor contained in the job. The total measured value of the job is then converted into a wage rate as an expression of the monetary worth of the job.

How Does Job Evaluation Function?

Every job is made up of four main factors or parts—skill, effort, responsibility, and working conditions, with varying amounts of each in different jobs. This statement may seem simple, but it is surprising how often it confuses those not familiar with the methods of job evaluation. For that reason the writer frequently uses a very simple illustration that may appear quite elementary to many.

Consider two closed boxes containing different amounts of four items, namely—steel, brass, aluminum, and lead washers. For the purpose of this illustration, assume that the steel washers are worth 25 cents per pound; the brass washers 40 cents per pound; the aluminum washers 70 cents per pound; and the lead washers 15 cents per pound. How would we proceed to evaluate the relative worth of these two boxes? We certainly would not guess at their value, neither would we say that, based on past experience, we can judge that box (1) is worth twice as much or half as much as box (2). We might try placing the two closed boxes, identical in appearance, side by side on a table in the conference room and request the assembled group of conferees to negotiate the value of these boxes, but it is very doubtful if a satisfactory agreement could be reached. Just imagine the confusion, lost time, and resentment that would result if an attempt were made to negotiate, or through collective bargaining to arrive at, the relative worth of one hundred such boxes. *Yet many wage agreements have been negotiated in just such a blind and unreasonable manner.*

It probably would not be too difficult a task to convince either a plant superintendent or a union committeeman that the correct and logical thing to do would be to take the cover from the boxes and look at their contents. We could obtain a weighing scale and determine that box (1) contains one pound of steel washers worth 25 cents; one pound of brass washers worth 40 cents; one pound of aluminum washers worth 70 cents; and one pound of lead washers worth 15 cents. By totaling the value of each item we would arrive at a figure of $1.50 for the total worth of the box.

Following the same procedure, it could be determined that box (2) contains one pound of steel washers worth 25 cents; one-half pound of brass washers worth 20 cents; one-half pound of aluminum washers worth 35 cents; and two pounds of lead washers worth 30 cents; or a value of $1.10 for the entire box. Therefore, the relative value of box (1) to box (2) is in the ratio of 150 to 110. Certainly there will be no argument on this method of arriving at the relative worth of each box.

For the purpose of further illustration, let us assume that there is a question regarding the accuracy of the scale that was used in weighing the washers. Faction *A* says, "The scale is reading 25 per cent high," and faction *B* says that it is reading 10 per cent low. Faction *A* says that box (1) is actually worth only $1.50 ÷ 1.25, or $1.20, and that box (2) is worth $1.10 ÷ 1.25, or $0.88. Faction *B* says that box (1) is actually worth $1.50 ÷ 0.90, or $1.666, and that box (2) is worth $1.10 ÷ 0.90, or $1.222. However, faction *A*, faction *B*, and the scale all are in agreement on one important fact: The relative worth of box (1) to box (2) which is $150 \div 110 = 1.364$; or $120 \div 88 = 1.364$; or $1666 \div 1222 = 1.364$.

Since our objective was to determine *the relative worth* of each box, we are still all in agreement, regardless of the accuracy of the scale. This is true only because we used the same scale to weigh both boxes. As long as we follow the correct method, and consistently use the same measuring instrument, we can all agree on the relative worth of each box. The difference of opinion on the actual value of both boxes can be easily settled by comparing a known weight with the weight of one box and using a correction factor in reading the scale.

If you were the prospective buyer or seller of these two boxes, you would agree that this method of evaluating their worth was fair and honest. Summarizing the steps of the procedure, we have: (1) Looked at the contents of each box; (2) measured the amount of each item contained in each box; (3) considered the unit value of each item present; (4) added the actual values of each item present; (5) compared the total evaluated worth with a known standard and converted it into the actual worth of each box.

Application to Job Evaluation

From this illustration, we can see how easily and accurately we can measure the value of these boxes. Measuring or evaluating a job can be done in a similar manner, and while the illustration may seem elementary, it aids greatly in the analysis of the methods used. Just as we opened up the boxes, it is necessary for us to see what the job looks like. This is done by means of an accurate and detailed job description. The primary consideration is how we can

measure the job content, and the amount of skill, effort, responsibility, and working condition requirements present in any job. We cannot weigh them on a scale as we did with the boxes; we cannot measure them with a yardstick or a micrometer; so we must find some other means of measurement for the purpose of job evaluation.

By reference to Chart 1, "Evolution of Basic Job Factors and Definitions," let us consider the factor called "Skill." By the definition we note that "Skill" is the trade knowledge and educational requirements of the job and the mental and physical ability to apply this knowledge to the job. This definition has such a broad coverage that it is not practicable to propose one unit of measurement for "Skill." Then let us see how the factor "Skill" can be broken down to a point where it can be measured.

From the original definition, two logical subdivisions occur—"Training" and "Aptitude." The factor "Training" is again subdivided into "Basic Education" and "Experience." The factor "Aptitude" is divided into "Mental Capability," "Judgment and Initiative," and "Physical Skill." Therefore we can say that the five basic factors "Basic Education," "Experience," "Mental Capability," "Judgment and Initiative," and "Physical Skill" together make up the major factor "Skill."

Furthermore, we have by this analysis reduced our major factor "Skill" to a point where it can be measured; the terms of measurement of each of these basic factors are noted on the chart. We still cannot weigh the factor "Skill" on a scale, but by assigning a certain number of points as the maximum value of each sub-factor, we can determine the amount of point allowance present in the requirements of each job.

Just as we can determine by investigation that the market value of the steel washers is 25 cents per pound, so we can determine by investigation that the market value of "Basic Education" is worth a certain number of points for the maximum requirement by the highest job we may wish to measure—or, for example, the number of points allowed for technical training equivalent to four years of college. For lesser degrees of requirement in "Basic Education" a smaller number of points is allowed.

These point allowances for the various degrees of "Basic Education" requirement are expressed in the form of a Guide Chart (see Chart 2) for this factor. The Guide Chart for the factor "Experience" shows the points allowed for varying lengths of training time required to learn the job. In the same way, each basic factor of a job has a Guide Chart by which its point values can be measured. Therefore, in job evaluation, our terms of measurement are the degree of the basic factor requirements of the job, and our units of measurement are points.

It is just as important to use the Guide Charts consistently for a final true measure of the relative value of jobs as it was in the box illustration to use the same scale to weigh both boxes. To permit a consistent application in the reasoning applied to each Guide Chart, a series of "Anchor Point Jobs" are set up as *reasoning reference points* for use as a means of calibrating our reasoning, if it should tend to become inaccurate or inconsistent.

Just as the aluminum washers have a different value per pound than the brass washers, each factor in a job has a different point value. The point allowances for each factor are added to get the total evaluated point value of the job.

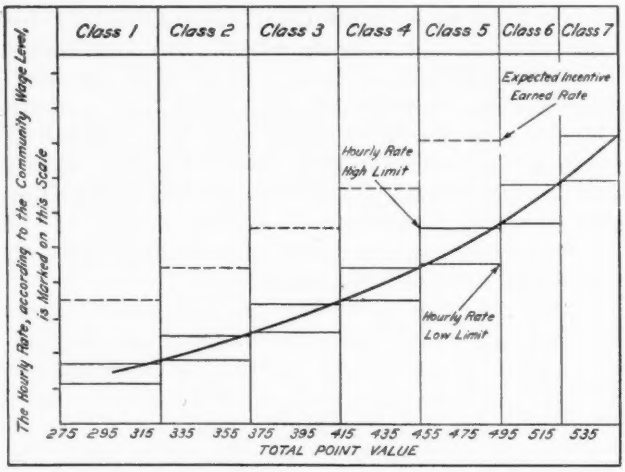
Chart 2. Guide Chart for Evaluating "Basic Education"*

Maximum Points, 90

Code	Points	Educational Requirements
I	0	Job does not require the ability to speak, read or write English.
II	5	Job requires the ability to speak English, read simple signs, read numbers, make out time card with no counting.
III	10	Job requires the ability to read, write very simply, count, and make out production records of repetitive work.
IV	11–20	Job requires the ability to read with ease, do simple arithmetical calculations, keep simple records, read simple blueprints, and make out records of non-repetitive work.
V	21–30	Job requires the ability to read and write with ease, do average calculations, and read blueprints.
VI	31–40	Job requires the ability to compile reports, write letters, and keep complicated records.
VII	41–50	Job requires a fair knowledge of several subjects, and the ability to write average letters and make difficult calculations.
VIII	51–60	Job requires elementary technical training as acquired in first-year college or technical school or its equivalent.
IX	61–75	Job requires average technical training equivalent to two or three years of college or technical school.
X	76–90	Job requires high technical training equivalent to four years of college.

*"Basic Education" is the degree to which the duties of the job require the use of formal education or its equivalent in practical experience.

Chart 3. Wage-Scale Curve



If we plan to weigh very small parts, we select a weighing scale with the right range and suitable accuracy for that purpose. On the other hand, if we must weigh very heavy items, we will select a different scale, but again with the right range and suitable accuracy. In the same way, we select or prepare a job evaluation plan that will be most suitable for the range of jobs that we wish to measure. The important fact to keep in mind is that the same plan and the same reasoning must be used throughout the job evaluation program. The application of consistent reasoning throughout will determine the ultimate accuracy and usefulness of job evaluation to a much greater degree than the particular type of plan.

Wage-Scale Curve for Determining Wage Rates

To arrive at the actual wage rate that should be paid for a particular total point value, or the rate range that applies to a certain range of point values, requires the construction of a wage-scale curve (Chart 3). This curve, based on the community wage level, will show the relationship between point value and wage rate, and is used to convert point values to wage rates.

A summary of formal job evaluation procedure is almost identical with the method of evaluating the relative worth of the boxes in our original illustration, and it is no more difficult to apply. Summarizing the steps of formal job evaluation procedure, we have: (1) Looked at the "requirement content" of each job by means of a factual job description; (2) measured the amount of each factor required by the job through the use of a Guide Chart; (3) considered the "weighted value" of each factor in the job and recorded the factor requirements in terms of points allowed; (4) added the actual point value of each factor to determine the total job value; (5) compared the total evaluated point value with a known standard through the use of the wage-scale curve, and in so doing determined the job wage rate.

What Can Formal Job Evaluation Accomplish when Properly Established and Administered?

If you are a member of the labor group, would you like to be promoted to a job requiring more experience and skill and then receive less pay than on your former job? Would it make you happy to spend four years learning your trade and then see a new recruit equal or better your earnings in a few weeks? Would you like to feel that you have reached your maximum earnings simply because no monetary recognition is given to the greater job requirements of the more difficult jobs for which you are preparing yourself? Would you want your union representative or foreman to guess at the rate your job should pay? Without a good plan of formal job evaluation, you may be confronted with these actual conditions.

If you are a member of the management group, would you like to find yourself faced with a deluge of requests for transfers from your capable experienced workers demanding, through seniority rights, the privilege of working on the simple easy tasks that pay as much or more than the difficult jobs? Do you want a dissatisfied group of employes because you have no orderly plan of up-grading? Do you want your cost of training new men to be much higher than is necessary? You definitely will be faced with these or similar problems if you do not have a sound plan of formal job evaluation, properly administered.

The primary objective of a formal job evaluation plan is to permit a fair and consistent distribution of your payroll—not to increase it or to decrease it. Through the use of formal evaluation, job rates are established for the actual worth of the job to the company. Dissatisfaction over rates of pay is frequently caused, not by the size of the labor payroll, but by the inconsistent or unfair allocation of the payroll. Rates established by planned job evaluation are not only consistent with the worth of the job, but are established on a basis of reason that can be discussed, explained, and defended. It is certainly much more satisfactory to discuss the job "content" of one job, compared with another, than to tell a workman that the foreman does not consider his job quite as important as another job.

Effect on the Up-Grading of Workers

With jobs classified by point evaluation, it is a relatively simple procedure to set up a logical system of up-grading. It should be noted as part of each job specification record that this par-

ticular job may be filled by promotion from certain other jobs of lower point value. On the same record it should be noted that this job trains for another job or certain other jobs of higher point value. If these up-grading recommendations that appear on the job specification card are honestly followed, every workman will have a true incentive to do his best on his job, so that he may be qualified for advancement as openings occur on the higher point value jobs.

This system of up-grading automatically reduces learning time and increases the versatility of the workmen. For example, if jobs are classified with Class I as the lowest point value jobs, let us review the steps of procedure if an opening occurs on a Class IV job. The workman best qualified by seniority and merit is advanced from a Class III job. He is already prepared for this advancement because his Class III job has been training him for the Class IV job. In a like manner, a workman on a Class II job is advanced to the Class III job, and a workman on a Class I job is advanced to the Class II job. This leaves an opening on a Class I job to be filled by the employment office.

Effect of Job Evaluation on Employment of Handicapped Workers

The problem of employment of physically handicapped persons, currently magnified by war conditions, is most easily approached from a study of job requirements. The job requirement information needed for this purpose is a direct by-product of a formal job evaluation plan. The detailed job descriptions obtained for a measurement of "job worth content" are equally satisfactory for a measurement of "job physical requirement content." Job conditions —an important factor in this problem—are also available from the job descriptions.

The hiring procedure is simplified by job evaluation. The supervisors request men from the employment office by job numbers. Since this job number refers to a definite job specification, there is no misunderstanding regarding the requirements. The employment office has sufficient and accurate enough information to permit proper placement of employes.

Any plan is only as effective as the way in which it is carried out or administered, and job evaluation is no exception. A good plan of job evaluation, poorly administered, can cause as much harm as no plan, or more. Honesty in job assignments, correct records of transfer, a conscientious use of the up-grading provisions, and an understanding of the fundamental principles are absolutely essential for the successful application of formal job evaluation.

Formal job evaluation is not a complicated procedure that should arouse the suspicion and distrust of either management or labor. It is a practical common-sense approach to the problem of wage administration. If honestly administered, it can be one of the most useful tools of management, and at the same time be labor's assurance of a square deal on the rate question. Formal job evaluation eliminates guesswork and provides an objective measuring plan in rate determination. The benefits to be derived from such a plan, both from the viewpoint of management and labor, are worth securing.

New Officers of American Society of Tool Engineers

BECAUSE of wartime conditions, the American Society of Tool Engineers cancelled its thirteenth annual meeting, to be held this spring. Instead, a meeting of the members of the board of directors and the national committee chairmen was held in Detroit, March 23 and 24.

At this meeting, C. V. Briner, manager of the Gage and Tool Division of the Pipe Machinery Co., Cleveland, Ohio, was elected president of the Society; A. M. Sargent, president and general manager of the Pioneer Engineering & Mfg. Co., Detroit, Mich., was elected first vice-president; W. B. Peirce, vice-president of research and development of the Flannery Bolt Co., Bridgeville, Pa., was elected second vice-president; Thomas P. Orchard, partner and general manager of the American Tool Engineering Co., New York City, was elected third vice-president; A. M. Schmit, general manager of the A. M. Schmit Co., Toledo, Ohio, was elected secretary; W. J. Frederick, president of the Frederick Steel Co., Cincinnati, Ohio, was elected treasurer; and W. A. Dawson, chief master mechanic of DeHaviland Aircraft of Canada, Ltd., Toronto, Canada, assistant secretary-treasurer.

The report of the National Membership Committee indicated that the present membership is 17,918—an increase of 2498 in the last year; 1173 members are in the armed forces of the United States, many of whom are serving in capacities where their peculiar skills and training are being capitalized in the war effort.

Houston, Tex., was selected as the place for the 1946 annual meeting of the Society. The type of meeting to be held in Houston and the fall meeting scheduled for Pittsburgh in October of this year will, of course, be determined by the war conditions at that time and the regulations concerning travel that may be issued by the Director of War Mobilization.

Questions and Answers

A Department in which the Readers of MACHINERY are Given an Opportunity to Exchange Information on Questions Pertaining to the Machine Industries

Steel for Punches Subjected to Abrasion

O. S.—We are using two punches, one upper and one lower, operating in a steel cylinder for forming pellets. The upper punch wears very rapidly and has to be replaced often because of abrasion from the pellet material. Can you recommend a suitable material that would give longer life?

Answered by Editor, "Nickel Steel Topics"
International Nickel Co., Inc., New York City

Our first recommendation would be the use of a tool steel containing from 0.35 to 0.60 per cent carbon, 1.20 per cent tungsten, 5 per cent chromium, and 1.20 per cent molybdenum. The low-carbon content grades are suitable for punches for working steel. When impact is not a factor, a carbon content near the upper percentage range is usually employed, as this steel has better wear resistance.

In some applications, nitrided steel has given unusually good service. The objection to nitrided material is, however, that as soon as the case is worn away, the tool is no longer useful. On the other hand, nitriding provides a very hard case, which is unusually wear-resistant.

It is also possible that an alloy cast iron might be satisfactory, provided there is no appreciable impact load. "Ni-Hard" is an alloy cast iron containing nickel and chromium. This material has given excellent service for sand-blast nozzles, ceramic molds, ball mill liners, and similar applications where abrasive wear is a serious problem.

Does the O. P. A. Control Sales Made by a State?

P. F.—According to the laws of one state, certain state authorities cannot legally make any sale except to the highest bidder at auction. The question is, can the O.P.A. regulate such sales?

Answered by Leo T. Parker, Attorney at Law
Cincinnati, Ohio

In Soundview Co. v. Taylor [150 Pac. (2d) 839], reported September, 1944, and decided by the Supreme Court in Washington, it was shown that a person was the highest bidder at a public auction of products grown on state lands. This bidder was informed by the Office of Price Administration that his bid was above the ceiling price and that if he consummated the purchase the Price Administrator would hold him responsible.

The Supreme Court held that the buyer could legally make the purchase at a price higher than the O.P.A. ceiling price. The Court said: "It would seem that... a grave doubt exists as to whether Congress, in enacting a war measure relating to the fixing of prices at which commodities may be sold, has the power to make it applicable to a state with reference to property it owns and holds for the purpose of carrying on its governmental functions."

This is the only higher court case on record where this particular point of law is involved, and whether other courts will agree with the decision remains to be seen.

* * *

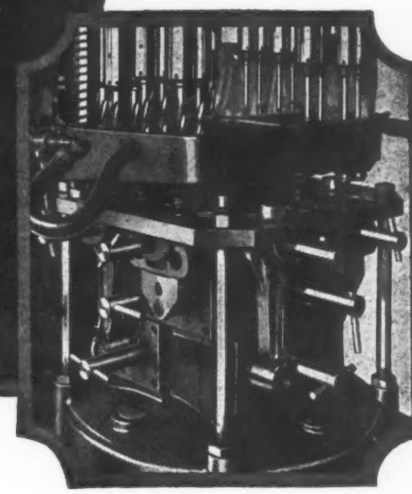
New Rubber Molding Process

What is known as the "Hyspeed" plunger molding press for plastics, built by the Baldwin-Southwark Division of the Baldwin Locomotive Works, Philadelphia, Pa., was referred to in the technical press some months ago. In conjunction with this development, the Baldwin-Southwark organization, working with the Westinghouse Electric & Mfg. Co., which designed an electronic heating device, has announced a new method of molding rubber on a small high-speed press. This method is said to effect a substantial reduction in the curing time of the rubber, compared with equipment now in use. Owing to the high speed of the machine, a small press can produce in a given time the same number of moldings as a larger conventional type press. Both natural and synthetic rubbers have been handled with success.

* * *

A shipyard with fifty ways built sixty-nine riveted ships aggregating 507,000 deadweight tons in 1919; in 1943, a twelve-way Maritime Commission yard turned out 205 welded ships totaling 2,150,000 tons.

Design of Tools and Fixtures



Indexing Blocks Simplify Grinding Operations

By FRITZ L. KELLER, Bloomfield, N. J.

Surface grinders equipped with a magnetic table chuck can be used advantageously for grinding square, hexagonal, and other shapes by the use of simple indexing blocks, as shown in the accompanying illustrations. These comparatively simple blocks make it possible to handle work that would otherwise require the use of an expensive indexing head.

In Fig. 1, index-blocks are shown set up for grinding a square broach. The same blocks, however, can also be used for grinding flats on broaches of many different shapes and for grinding a variety of parts by holding the pilot and shank ends of the broach or work in the blocks by means of split bushings and headless setscrews.

The holes in the index-blocks are centrally located and ground square with the faces. With these blocks, the broach can be held securely and can be indexed from side to side by simply turning over the broach and blocks. It is usually good practice to first rough down the broach, allowing just sufficient stock for a final finishing touch.

Similar index-blocks can be used to advantage in grinding hexagonal broaches or broaches of other shapes by simply making blocks having six to twelve sides of equal length. It is, however, unsatisfactory or hazardous to use blocks having more than twelve sides, as the magnetic area of the flats in contact with the magnetic chuck is then greatly reduced and is likely to be insufficient to hold the blocks and broach while grinding without using hold-down straps.

The plate shown with the strap in Fig. 1 helps to keep the broach parallel with the axis of the blocks and provides a backing for the blocks where most needed. The strap gives added strength for holding the outer block down on the magnetic chuck. When the blocks are made with a large hole for the use of bushings of

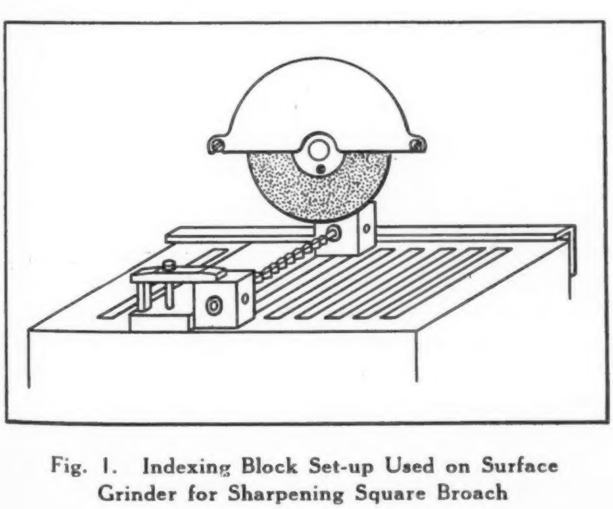


Fig. 1. Indexing Block Set-up Used on Surface Grinder for Sharpening Square Broach

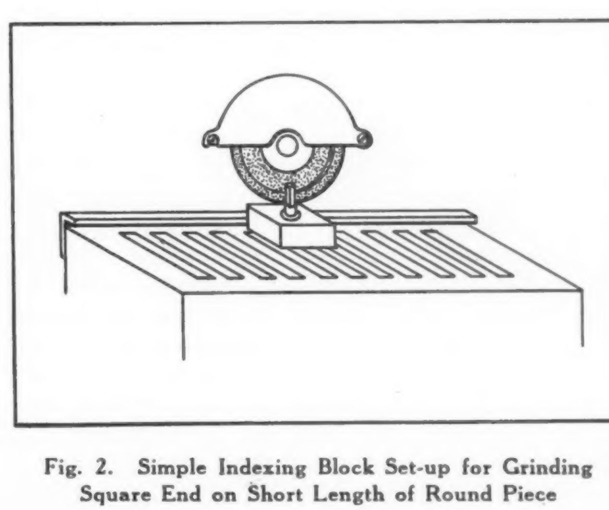


Fig. 2. Simple Indexing Block Set-up for Grinding Square End on Short Length of Round Piece

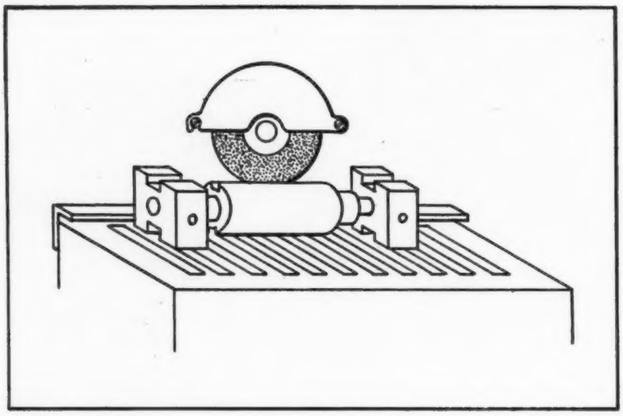


Fig. 3. Set-up for Grinding Keyways on Opposite Sides of Cylindrical Part

different sizes, a wide variety of work can be accommodated.

Two different applications of work-holding blocks are shown in Figs. 2 and 3. These set-ups are found equally satisfactory in grinding squares on punches and small parts. The square end on the part shown in Fig. 2 is ground by pushing the index-block up against the back-stop on the magnetic chuck and indexing the block around from side to side until the four sides of the work have been finish-ground. The largest surface of the block rests upon the magnetic chuck, which holds the block and work securely during the grinding operation.

In Fig. 3 is shown still another application of indexing work-holding blocks on the magnetic chuck of a surface grinder. This simple set-up is used for grinding keyways on diametrically opposite sides of a cylindrical bar. The blocks are bored and ground to fit both ends of the shaft, and clearance is provided so that the grinding wheel can pass through the slots in the blocks and over the work when grinding the keyway. By using a grinding wheel that is narrower than the width of the keyway to be ground, the opposite sides of the keyway can be ground separately. In this case, the shaft, together with the blocks is turned around so that the face at the front of the machine will be at the rear. This relocating or reversing of the work and blocks results in centralizing the ground keyway. When the opposite keyway is to be ground, the blocks with the shaft are simply turned upside down and the grinding procedure repeated.

This method has many advantages over the index-head and tail-center generally used for this kind of work. A very important advantage of this set-up is that the grinding wheel has sufficient clear space to permit it to be fed back and forth for grinding the keyway without running into either the tailstock or headstock. It also holds the work firmly and low or close to the machine table.

Fixture for Grinding a Helical Gage

By L. KASPER, Philadelphia, Pa.

A number of gages like the one shown in Fig. 2 of the accompanying illustration were required to be ground to close tolerances. This part consists of a tapered shank with the working end in the form of a helix. The helix is to be made with a twist of one full turn in 10 inches. Owing to the slow spiral and the required accuracy of the part, it was considered impossible to produce the helix with standard machine tools. Therefore, the fixture here illustrated was designed.

Primarily, the fixture consists of a work-holding part supported on a carriage which is given a longitudinal movement, and means for imparting a partial revolution to the work during the longitudinal movement. Fig. 1 shows a plan view of the fixture, Fig. 3 an end view, and Fig. 4 a front elevation.

Referring to the illustrations, the table of the grinding machine *A* is rendered immovable, so that any possible movement can take place only in the fixture itself. The block *B* is dovetailed to carry the slide *C*, which is given a reciprocating movement by the rack *J* and pinion *K* through the handwheel *L*. The slide *C* is dovetailed to carry the slide *D*, which carries the roller *H*. Both slides *C* and *D* are carefully scraped to eliminate vibration and lost motion.

The work-spindle *N* is carried in bearings which form a part of slide *C*, and carries the sector *F*. Sector *F* is connected to the block on slide *D* by a flexible steel tape *G*. Roller *H* is in contact with the cam plate *I* attached to block *B*. Spring *P* serves to maintain contact between the roller and the cam by virtue of the pull exerted on slide *D* by tape *G*.

The question may arise as to why slide *D* and spindle *N* are not connected by a rack and gear instead of a sector and tape. The reason is that it was decided that a gear motion would not produce a sufficiently accurate movement to meet the requirements. As tape *G* is positioned to come in contact with sector *F* at the point of tangency, any movement of the two parts would be exactly identical, measured at the periphery of the sector and at any point of slide *D*.

The grinding is accomplished by the grinding wheel *M*, which is set with its axis exactly at right angles to the axis of the gage part.

The operation of the fixture is as follows: The gage *W* to be ground is carried in the spindle *N*, which is free to rotate in its bearings with sector *F*. As a reciprocating motion is imparted to slide *C* by giving the handwheel *L* an oscillating motion, the slide *D* is given a reciprocating motion by the action of cam *I* on roller *H*. The reciprocating motion of slide *D* is converted into an oscillating motion of spindle *N* through

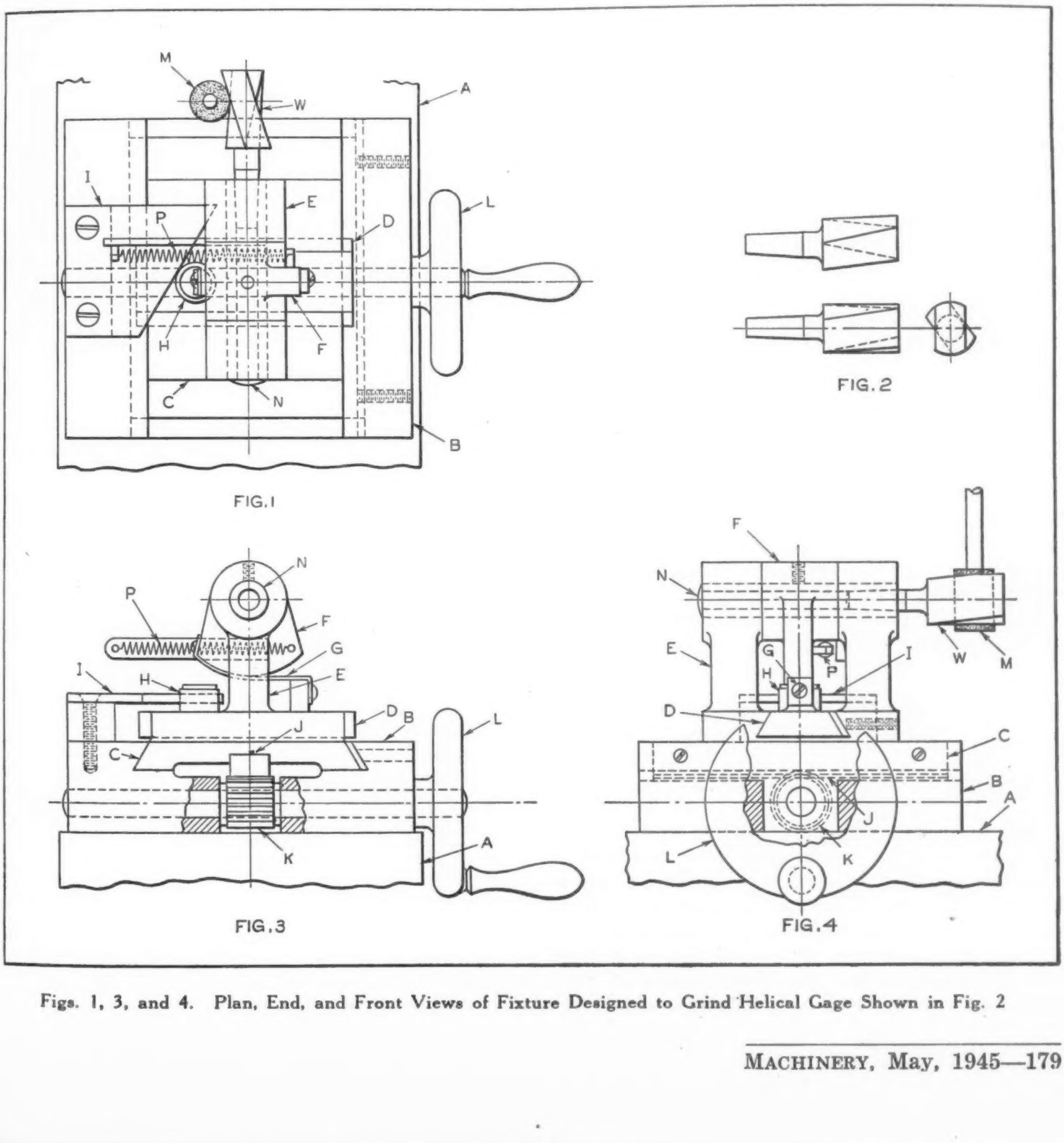
the sector F and the tape G. As both these movements act on spindle N, the latter is given an oscillating motion synchronized with a reciprocating motion. In this manner, the grinding wheel generates a helix on the work W.

The lead of the spiral thus produced is governed by the relationship between the movements of slides C and D, which is controlled by the angle between the working edge of cam I and the path of slide C. This angle can easily be computed in the following manner, using the actual figures of the case in point:

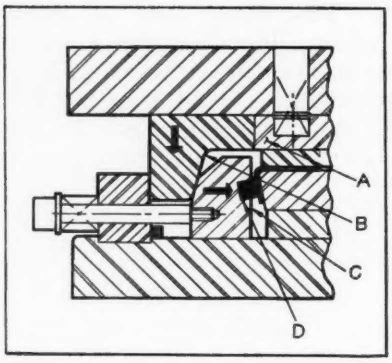
The required lead of one turn in 10 inches may be expressed as one-tenth turn in 1 inch. Hence, it is obvious that in order to produce the required helix, it is necessary for the spindle N to rotate 36 degrees, or one-tenth turn, while the slide C moves 1 inch. The sector being of 1-inch radius, the circumference of the complete circle would be 6.2832 inches, one-tenth of which equals 0.6283 inch. Therefore, slide D must move 0.6283 inch while slide C moves 1 inch. A triangle may thus be formed with two known sides of 1 inch and 0.6283 inch in length. By trigonometry, the angle of the cam I relative to the axis of spindle N is, therefore, 32 degrees 8 minutes 30 seconds.

Die for Flange Angle-Correcting on Aircraft Stabilizer Ribs

The tool designers of the Goodyear Aircraft Corporation, Akron, Ohio, have devised a mechanical correcting die for giving the flanges formed on the four sides of aluminum aircraft stabilizer ribs an extra inward bend, as required to compensate for spring-back and to set them



Figs. 1, 3, and 4. Plan, End, and Front Views of Fixture Designed to Grind Helical Gage Shown in Fig. 2



Cross-section of One of the Four Sides of a Mechanical Die Designed to Correct Angle of Bent-down Flange on Aircraft Stabilizer Rib

at the correct angle with the web. The illustration shows a cross-section of one side of the flange angle-correcting die, which is designed to over-bend the flanges on all four sides of the beam or rib simultaneously to an angle of 88 degrees.

The ribs are blanked out and then formed in a mechanical die. Previously, angle correction was obtained by employing a slow acting, hydraulically operated forming die. With the new die, constructed as shown in the illustration, uniform parts are produced at the rate of about 600 ribs per hour. In addition to increasing production, the new die has the advantage of handling work satisfactorily that has slight variations in thickness and tensile strength.

As shown by the illustration, the general construction of the angle-correcting die follows that of standard steel cam-operated dies. A spring pad *A* is provided in the upper die member to clamp the rib on the lower die member or forming block. As the ram of the press travels downward, the cams *B* come in contact with the sliding cam members *C* on the lower shoe. The sliding cams are forced against the stabilizer rib, causing the flanges to be re-formed or set to the required angle of 88 degrees with the web.

The use of rubber inserts *D* compensates for over-travel of the cams *B* and for variations in stock thickness. In cases where the ribs vary only slightly in size, one cam-actuated die of the design shown will take care of ribs of several sizes, the only change necessary being in the size of the lower die member.

Improved Stop-Collar

By MICHAEL AXLER, Springfield Gardens, N. Y.

The improved stop-collar shown in Fig. 2 of the accompanying illustration was designed to take the place of the old style collar shown in Fig. 1. The new collar can be used on machine shafts wherever an adjustable collar is needed. The old style collar in which a set-screw is used to grip the shaft has the disadvantage of leaving burrs on the rod, which may require the use of a hammer when it becomes necessary to move the collar to a new position. There is also the danger that the cap-screw may cause an accident when the stop-collar is used on a rotating shaft.

The improved collar (Fig. 2) can be made to fit the shaft or rod snugly and yet permit quick and easy adjustment. It is made in three pieces, collars *A* and *C* (Fig. 3) having bored tapered holes, as shown, which fit the tapered split bushing *B* (Fig. 4). One of the collars *C* has three drilled and tapped blind holes, while the other collar *A* has matching holes drilled and counterbored to take Allen cap-screws, as shown in the assembly view (Fig. 2).

In assembling the unit, bushing *B* is simply placed between the two collars *A* and *C*, which are then clamped together by means of the cap-screws. When the collars are properly tightened on the split tapered bushing, the bushing will obtain a firm grip on the shaft. The position of the stop-collar can be changed by simply loosening the set-screws to permit the tapered split bushing to spring open and release its grip on the shaft.

* * *

It is estimated that in the 20 per cent shift from munitions to civilian goods manufacture expected during the first three months after VE day, some 20,000 prime contracts and 400,000 sub-contracts will be terminated.

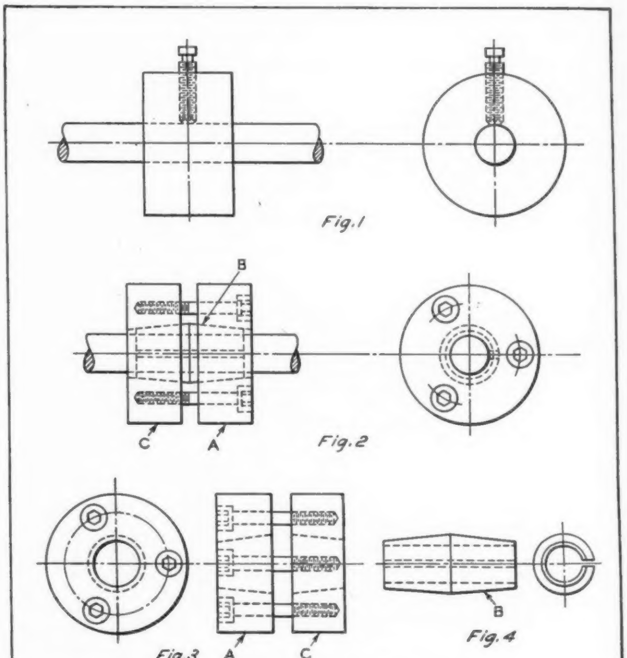


Fig. 1. Old Type of Stop-collar. Fig. 2. New Stop-collar Designed to Replace the Type Shown in Fig. 1. Fig. 3. Collars Shown Assembled in Fig. 2. Fig. 4. Split Bushing Used in New Stop-collar

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Molybdenum-Tungsten Steel Handbook

CLEVELAND TWIST DRILL CO., 1250 E. 49th St., Cleveland 14, Ohio (Department P). Fifth edition of the "Mo-Max Handbook," containing details on standard and special analyses of Mo-Max; brief instructions on forging, annealing, hardening, quenching, and tempering; new sub-zero treatments; tool performance; hardness curves, etc. 1

High-Speed Carbide Milling

CINCINNATI MILLING MACHINE CO., Cincinnati 9, Ohio. Booklet M-1376, containing recommendations for high-speed carbide milling, including speeds, feeds, cutter angles, carbides, etc. Booklet M-1377, containing recommendations for the grinding of cutters for high-speed carbide milling. 2

Hardenability Calculator

TIMKEN ROLLER BEARING CO., Canton 6, Ohio. Circular slide-rule for computing the approximate hardenability of steel from its chemical composition and grain size. Copies may be had without charge if requested on the letterhead of the firm with whom the writer is connected. 3

Cone-Drive Gearing

MICHIGAN TOOL CO., Cone Drive Division, 7171 E. McNichols Road, Detroit 12, Mich. Bulletin 745, entitled "Post-Graduate Course for Gears," recording some of the war-time uses of cone-drive gearing with the object of serving as a suggestion source for designers of new products. 4

Synthetic Elastic Sheet Stocks

E. I. DU PONT DE NEMOURS & CO., INC., Fabrics Division, Fairfield, Conn. Booklet A4549, containing data on Fairprene sheet stocks for applications requiring resistance to oils and greases, heat and cold, acids and alkalies, flames, etc. 5

Twist Drills and Reamers

CHICAGO-LATROBE TWIST DRILL WORKS, 411 W. Ontario St., Chicago 10, Ill. Leaflet entitled "Cutting Tools for Efficient Operations," listing different types of

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twist drills, reamers, and countersinks, and the particular classes of work for which each is adapted. 6

Aluminum-Bronze Welding Rods

AMPCO METAL, INC., 1745 S. 38th St., Milwaukee 4, Wis. Bulletin W-2, describing various methods of welding with Ampco-Trode electrodes. Bulletin W-3, describing five standard types of Ampco-Trode aluminum-bronze weldrod. 7

Motor Selector Guide

DUMORE CO., Motor Division, Racine, Wis. Booklet entitled "Fractional-Horsepower Motor Selector," designed to assist design engineers and production executives in selecting the correct type and size of fractional-horsepower motor for any application. 8

Single-Ram Broaching Machines

COLONIAL BROACH CO., P. O. Box 37, Harper Station, Detroit 13, Mich. Bulletin VAS-45, describing the company's standard line of improved single-ram broaching machines designed for surface broaching. 9

Corrosion-Resistant Chain and Tubing

YOUNGSTOWN WELDING & ENGINEERING CO., Youngstown 9, Ohio. Bulletin C-145, containing specifications covering "Weldco" corrosion-resistant chain. Catalogue T-145, covering "Weldco" tubing, fittings, and fabricated piping. 10

Screw Machine Products

FEDERAL SCREW WORKS, 3401 Martin Ave., Detroit 10, Mich. Booklet entitled "Focus on Federal Screw," describing what this company can do in the contract manufacture of screw machine products and cold-forged parts to customers' specifications. 11

Welding and Cutting Equipment

VICTOR EQUIPMENT CO., 844 Folsom St., San Francisco 7, Calif. Bulletin entitled "Setting up a Victor Welding or Cutting Unit," prepared especially for vocational training schools and beginners in welding work. 12

Heat-Treatment

PERFECTION TOOL & METAL HEAT TREATING CO., 1740-58 W. Hubbard St., Chicago 22, Ill. Booklet entitled "Fifty Facts," dealing with the hardening of steel, and describing the "Ad-Life" treatment for previously hardened, finished tools. 13

Tangent Benders

STRUTHERS WELLS CORPORATION, Titusville, Pa. Bulletin 58-T, containing data on single-wing, double-wing, and stretch-wing tangent benders, including typical examples of work formed on these machines in one operation. 14

Carbide Boring Tools

TUNGSTEN CARBIDE TOOL CO., 2661 Joy Road, Detroit 6, Mich. Bulletin 115, describing this company's line of "convertible" carbide-tipped and solid-carbide boring tools available for immediate delivery. 15

Hydraulically Operated Disk Grinder

KINDT-COLLINS CO., 12651 Elmwood Ave., Cleveland 7, Ohio. Bulletin B-1, descriptive of the Kindt-Collins Master hydraulically operated 30-inch disk grinder for metal, wood, and plastics. 16

Electronic Temperature-Control Equipment

WHEELCO INSTRUMENTS CO., Harrison and Peoria Sts., Chicago 7, Ill. Bulletin D2-4, on the Wheelco "Capacitrol," a temperature-control instrument operating on the electronic principle. 17

Locking System for Threaded Parts

BARDWELL & MCALISTER, INC., Box 1310, Hollywood 28, Calif. Circular 1068A, descriptive of the Rosan locking system for locking threaded inserts and studs in all materials. 18

Motor-Drive Transmissions

WESTERN MFG. CO., 3400 Scotten Ave., Detroit 10, Mich. Catalogue entitled "As Many as 500 in One

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Which of the new or improved equipment described on pages 200-220 is likely to prove advantageous in your shop? To obtain additional information or catalogues about such equipment, fill in below the identifying number found at the end of each description—or write directly to the manufacturer, mentioning machine as described in May, 1945, MACHINERY.

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Plant," describing three models of Western transmissions for motorizing various cone-driven machine tools, and typical applications. 19

Electrode Comparison Chart

ALLIS-CHALMERS MFG. Co., Milwaukee 1, Wis. Bulletin B6344A, containing a comparison chart of welding electrodes, covering equipment from twenty-two electrode manufacturers. 20

Flexible Shafts and Machines

N. A. STRAND & Co., 5001 N. Wolcott Ave., Chicago 40, Ill. Catalogue 29 (Fortieth Anniversary Issue), containing 112 pages listing 125 different types of flexible shafts and machines. 21

Thread Grinding

SHEFFIELD CORPORATION, Dayton 1, Ohio. Bulletin M-100-145, descriptive of the grinding of threads and forms with a multi-form wheel on the Sheffield precision thread and form grinder. 22

Hydraulic Power Equipment

JOHN S. BARNES CORPORATION, Rockford, Ill. Bulletin 10-G, describing a gun-spring tester, in which use is made of a John S. Barnes hydraulic pump and accessories. 23

Grinding Data

DAYTON GRINDING WHEEL DIVISION, SIMONDS WORDEN WHITE, 850 Negley Place, Dayton 7, Ohio. Bulletin entitled "101 Grinding Questions Answered," covering everyday grinding problems. 24

Grinding Wheels and Mounts

STERLING GRINDING WHEEL DIVISION OF THE CLEVELAND QUARRIES Co., Tiffin, Ohio. Circular descriptive of Sterling's "Easymounts" and grinding wheels for grinding tungsten-carbide and steel tools. 25

Low-Temperature Welding Alloys

EUTECTIC WELDING ALLOYS Co., 40 Worth St., New York 13, N. Y. Folder on Eutectic low-temperature welding alloys and rods, including application data. 26

Measuring Surface Finish

BRUSH DEVELOPMENT Co., 3405 Perkins Ave., Cleveland 14, Ohio. Bulletin illustrating and describing the Brush surface analyzer; also chart entitled "Surface Finish Nomenclature." 27

Gears

WESTERN GEAR WORKS, 417 Ninth Ave. S., Seattle 4, Wash. Folder entitled "Here is Why," explaining some of the "quick delivery" difficulties in the gear-cutting industry. 28

Low-Temperature Brazing

HANDY & HARMAN, 82 Fulton St., New York 7, N. Y. Circular 31, describing how Easy-Flo brazing was applied on an airplane brake assembly to speed up production. 29

Mechanical De-Burring and Finishing

STURGIS PRODUCTS Co., Sturgis, Mich. Bulletin describing "Roto-Finish," a mechanical process for de-burring and finishing metal parts. 30

Precision Forgings

STRUTHERS WELLS CORPORATION, TITUSVILLE FORGE DIVISION, Titusville, Pa. Bulletin 451, entitled "Titusville Heavy Steel and Alloy Forgings," showing typical examples of these forgings. 31

Soldering Tools

IDEAL COMMUTATOR DRESSER Co., 1011 Park Ave., Sycamore, Ill. Circular descriptive of "Thermo-Grip" electric soldering tools for the new higher melting-point solders. 32

Precision Cutting Tools

ILLINOIS TOOL WORKS, 2501 N. Keeler Ave., Chicago 39, Ill. Booklet entitled "How Illinois Tool Metallurgy Improves Cutting Tool Efficiency." 33

Hard-Facing Metal

FANSTEEL METALLURGICAL CORPORATION, North Chicago, Ill. Folder on "Fanweld," a hard-facing metal containing no steel and requiring no heat-treatment. 34

Gear-Shaper Cutters

COLONIAL TOOL Co., LTD., Windsor, Ont., Canada. Technical bulletin C-45, entitled "Gear Shaping and Shaper Cutters." 35

Induction Heating

AJAX ELECTROTHERMIC CORPORATION, Trenton 5, N. J. Bulletin 25, on induction heating and melting, showing many interesting applications of this process. 36

Remote Mechanical Controls

M. L. BAYARD & Co., 1914 Indiana Ave., Philadelphia 32, Pa. Bulletin A-100, describing in detail standard units of a remote mechanical control system of new design. 37

Chain Belts

CHAIN BELT Co., Milwaukee 4, Wis. Folders 460 and 461, on Rex Z-metal corrosion-resistant chain belts, and Rex "Table Top" conveyor chain, respectively. 38

Plastic Sheets for Drafting

DIRECT REPRODUCTION CORPORATION, 22 E. 40th St., New York 16, N. Y. Circular announcing plastic sheets for making drawings and metal reproductions. 39

Shot Peening

AMERICAN FOUNDRY EQUIPMENT Co., Mishawaka, Ind. Bulletin containing technical information on shot peening and its effect on the fatigue of metals. 40

Resinoid-Bonded Wheels

LARCO DIAMOND TOOLS, 551 Fifth Ave., New York City. Price list and specifications covering Larco resinoid-bonded diamond-impregnated wheels. 41

Safety Clamps

B. F. GOODRICH Co., Akron, Ohio. Circular showing applications of "Punch-Lok" safety band clamps for hose, cable, and similar products. 42

Protective Coatings

CARBOZITE CORPORATION, First National Bank Bldg., Pittsburgh 22, Pa. Pamphlet entitled "The Application of Industrial Coatings." 43

Lift-Trucks

HYSTER Co., Portland, Ore. Series of catalogues covering the complete line of Hyster pneumatic-tire lift-trucks. 44

Industrial Wire Cloth

BUFFALO WIRE WORKS Co., INC., Buffalo, N. Y. Catalogue 12, containing 56 pages of data on industrial wire cloth. 45

Materials of Industry

THE PROPERTIES AND NEW APPLICATIONS OF MATERIALS USED IN THE MECHANICAL INDUSTRIES

New Series of Manganese Alloys with Unusual Properties

A series of hardenable copper-nickel-manganese alloys is being introduced by the W. M. Chace Co., 1600 Beard Ave., Detroit, Mich. The first of this series of alloys, known as manganese alloy No. 720, has a nominal chemical analysis of 60 per cent copper, 20 per cent nickel, and 20 per cent manganese. It is a soft, ductile metal, which can be hot- or cold-formed into intricate shapes and then hardened to an unusual degree by a comparatively low-temperature aging treatment. This alloy differs from many precipitation hardening alloys in that dependable and uniform hardening does not require critical control of chemical analysis, fabricating technique, or heat-treatment.

The alloy in its hardened stage has high tensile and fatigue strengths, as well as a high ratio of yield strength and proportional limit to tensile strength. It has a wide range of useful properties which offer excellent possibilities in the design of springs, diaphragms, and other parts of intricate shape, as well as forgings. This alloy has a corrosion resistance not greatly different from that of the familiar cupro-nickels. It is available in most of the sizes and shapes in which stainless steel is ordinarily supplied. . .201

A Solvent Type Spray that Aids in Foundry Molding

A new solvent type mold spray, known as "Truline Mold Spray 91," has been brought out by the Hercules Powder Co., Wilmington, Del., for use in the foundry industry. The spray is made from a special resin, dissolved in a quick-burning solvent, and is applicable in the production of steel, iron, and non-ferrous castings.

Tests completed on both natural and synthetic bonded molding sands in the Hercules foundry laboratory and in several large industrial foundries in regular production have shown that Truline mold spray strengthens, hardens, and dries the mold surface in one operation. It was also found that production was speeded up and the number of rejected castings reduced, because the application of this solvent tended to guard against burned out binders and green spots in the mold.

This mold spray can be applied with either a spray gun, can, or paint brush. After application, it is ignited and allowed to burn off the mold, leaving a thin film of resin. This film tends to prevent loose sand from falling into the drag during the process of setting the core and closing the mold. 202

Lubricant Developed for Air-Driven Tools

A special lubricant, designated "Air Luboil," has been developed by W. C. Walters Co., Glendale, Calif., for use in air-driven tools. In addition to the basic oil, which maintains its strength over the entire range of speeds and temperatures normally encountered in air-powered equipment, a detergent is provided to clean all moving surfaces. A dispersing agent in the lubricant prevents oxidized particles of oil sludge from being deposited on the bearing surfaces. 203

Fanweld – A New Non-Ferrous Hard-Facing Metal

A new non-ferrous hard-facing metal has been developed by the Fansteel Metallurgical Corporation, North Chicago, Ill., under the name "Fanweld." This metal is intended to be applied to steel by means of the acetylene torch. It possesses remarkable resistance to abrasion, heat, impact, and erosion. The alloy contains tantalum-columbium carbide, which imparts to the hard-faced surface a peculiar self-lubricating action, minimizing the destructive effects of friction even at high temperatures. Extensive tests indicate that the new hard-facing alloy is especially well suited for hot-work punches, dies, and tools.

Properly applied, Fanweld "wets" steel surfaces readily without the use of flux, and flows smoothly and evenly. Metals as thin as 0.010 inch can be supplied with a fusion layer as thin as 0.0005 inch. No subsequent hardening or heat-treating operations are necessary. 204

To obtain additional information on materials described on this page, see lower part of page 182.

Multiple Grooving Tool for Cutting Closely Spaced Grooves in Turbine Cylinders

By W. K. CUTAIAR
General Foreman, Turbine Department
Merchant Marine Division
Westinghouse Electric & Mfg. Co.
South Philadelphia, Pa.

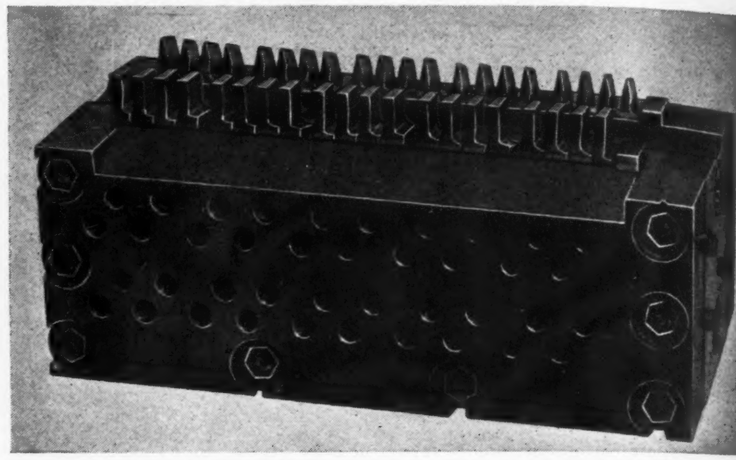


Fig. 2. Multiple Grooving Tool for Cutting Twenty Grooves in High-pressure Turbine Cylinder

THE set-up shown in Fig. 1 for cutting sixteen closely spaced grooves in the low-pressure turbine cylinder *A* employs a specially designed multiple grooving tool *B* in a block *C* mounted on the boring-bar *D*. Tool *B* is designed to hold two tool bits for each groove cut—in this case a total of thirty-two tool bits. Each of the sixteen square-point tools or bits in the leading row at *E* cuts a groove of the required width. Directly following these bits is another row *F* of sixteen tools. Each of these tools is pointed and cuts deeper than the square-point tool directly in front of it, thus serving as an effective chip-breaker.

The multiple grooving tool *B* is fed out of the boring block *C* by means of a tapered wedge in the hollow center of the boring-bar. The tapered wedge is actuated by a pull-rod from the end of the boring-bar, where a star-wheel feed is installed on the pull-rod.

The multiple grooving tool shown in Fig. 2 is similar to the one illustrated in the set-up Fig. 1, except that it is equipped with forty tool bits for cutting twenty grooves in a high-pressure turbine cylinder. The tools are set before the cylinder top is placed in position. The grooves are all cut at one setting of the tool. The time required for the grooving operations when this new equipment is used is approximately one-tenth that required with the old set-up.

Fig. 1. Low-pressure Turbine Cylinder with Top Removed to Show Special Grooving Tool B

* * *

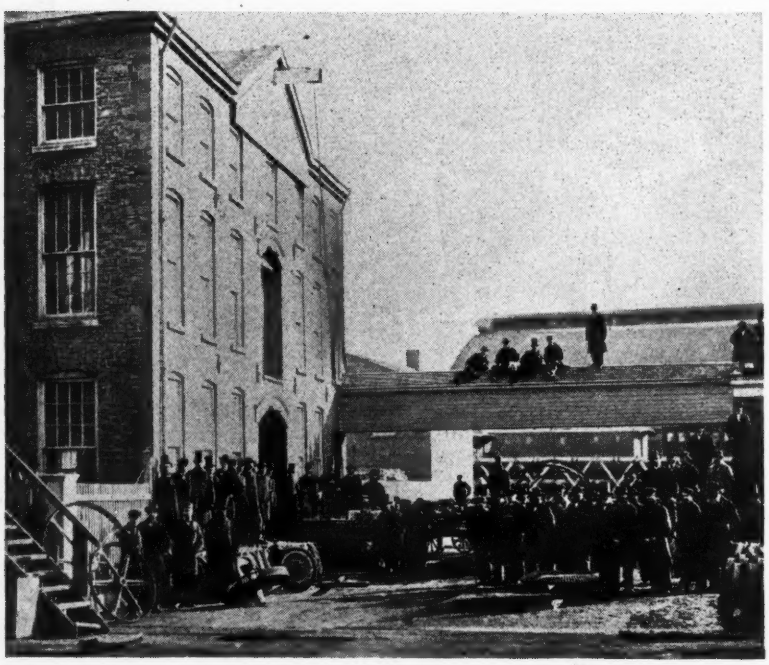
Gear Sales Still Expanding

The gearing industry, as represented by the members of the American Gear Manufacturers Association, with headquarters in the Empire Bldg., Pittsburgh 22, Pa., showed an increase in volume of sales of 2.5 per cent for February, 1945 (the last month for which complete statistics are available at this printing), as compared with January. The figures given in this report do not include turbine or propulsion gearing.

Eightieth Anniversary of Gleason Works

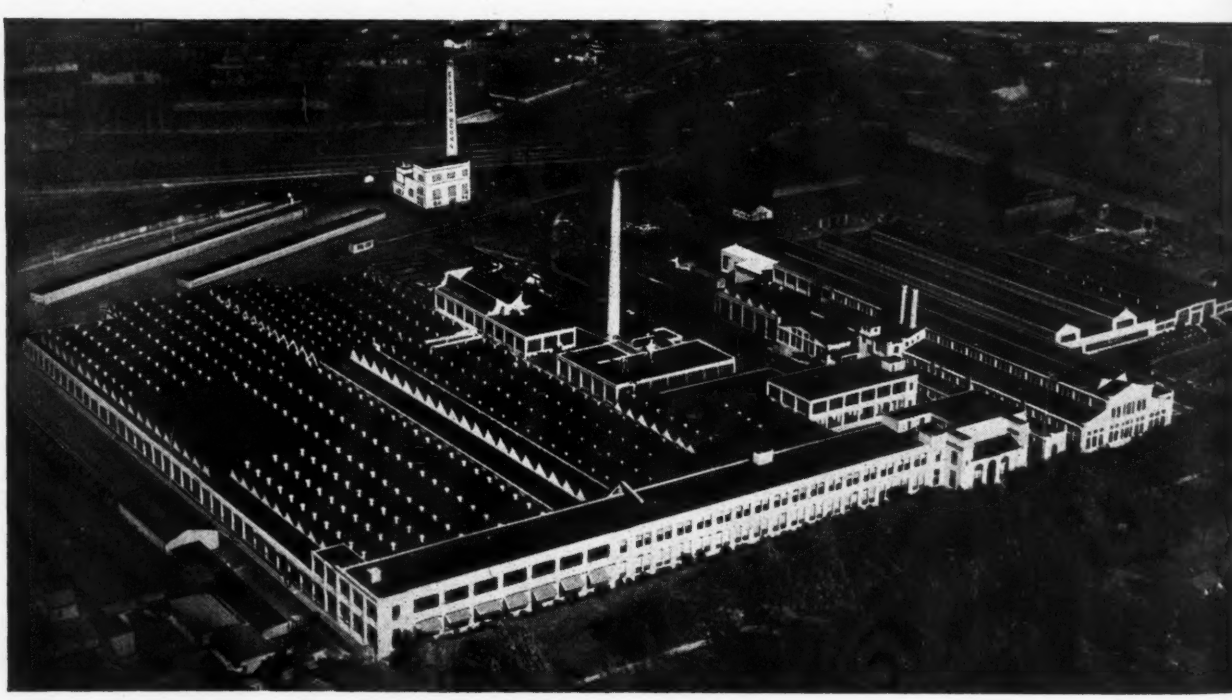
On Saturday, April 7, four hundred industrial and business leaders from Rochester, N. Y., and from many parts of the United States, gathered in that city at a luncheon at the Country Club of Rochester as guests of the Gleason Works to celebrate the eightieth anniversary of the founding of that well-known machine tool building concern. In the forenoon, 150 invited guests visited the works to inspect operations being performed by the 1800 Gleason employes, who worked as usual at their job of building bevel-gear machinery. The guests included Army and Navy officials, leading machine tool builders, and civic and business leaders of Rochester.

Later, at the luncheon, James E. Gleason, president of the Gleason Works since 1922, and son of the founder of the company—William



(Left) Photograph Taken in 1865 of the First Gleason Plant and Working Force, which Numbered less than Fifty Men

(Below) Present Plant of the Gleason Works which Now Employs over 1800 Men and Women



Gleason—welcomed the guests and modestly attributed the success of the Gleason Works over the long span of years to the efforts of the entire organization. The luncheon meeting was presided over by E. Blakeney Gleason, a grandson of the founder, who is vice-president and treasurer of the company and general manager of the plant.

During the evening, the plant was open to the company's employes and their families and friends and invited guests. Some 7000 people took part in the evening ceremonies. The climax of the evening came when the employes presented James E. Gleason and E. Blakeney Gleason each with a handsome specially designed desk set. Each set consisted of a gold-plated fluorescent lamp and base with a clock and pen holders. The pieces were ornamented with straight, spiral, and Zerol bevel gears and curvic couplings cut on Gleason machines.

The Gleason Works was founded by William Gleason in 1865, just at the close of the Civil War. At first, the company manufactured a general line of machine tools, especially engine lathes and planers; but in 1874, Mr. Gleason developed a machine for cutting the teeth of straight bevel gears. This machine, patented in 1876, was the first commercially successful machine developed specifically for cutting such gear teeth. It was a bevel gear planer of a form-copying type. The basic principles were so mechanically correct that they are used to this day in the largest sizes of bevel-gear cutting machines built by the Gleason Works. The original machine is still in existence; after over forty years of operation, it was presented to the Ford Museum at Dearborn, Mich.

Ever since the production of this first machine, the company has been a pioneer in the development of gear-cutting machines. Today the Gleason Works builds machines for manufacturing gears of all sizes, ranging from a fraction of an inch to over 40 feet in diameter.

How the Manufacturing Engineering Committee of the A.S.M.E. Serves Industry

MORE than forty projects undertaken at the request of the Government to aid industry in adopting more efficient production methods have received consideration during the past year by the Manufacturing Engineering Committee of the American Society of Mechanical Engineers. This committee was organized about two years ago by the Society at the request of the War Production Board, through the Office of Production Research and Development.

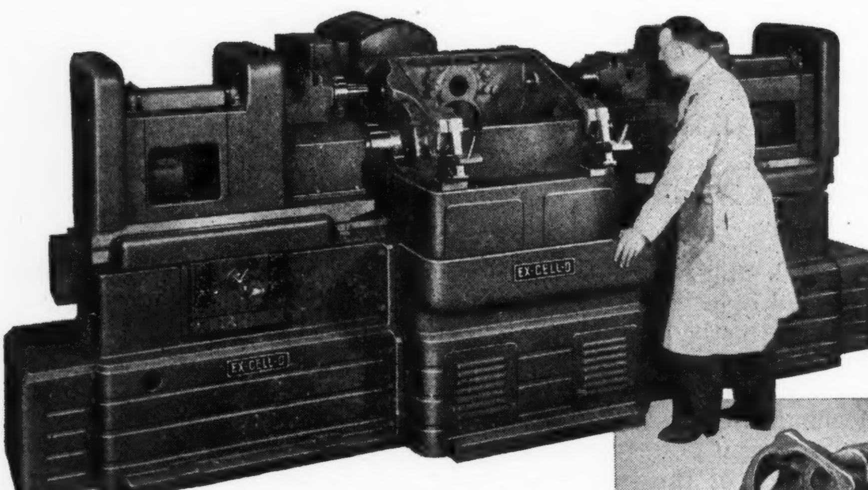
While originally created to serve the War Production Board, the assistance of the committee is available to any war production agency for consultation about production and mechanical process problems. In their effort to increase production with existing equipment and man-power, manufacturers throughout the country have been availing themselves of data compiled by the committee, based on investigations of manufacturing and shop processes.

Much of the committee's work has dealt with the distribution of information on high-speed milling. A great deal, if not most, of the research in this direction has aimed at improving and speeding up existing equipment without increasing man-power; this has aided in solving the problem of increasing production without increasing the number of employes. The committee has functioned as a clearing house for such information by compiling and distributing to industry sets of data sheets outlining jobs in actual operation, as well as other information that could be immediately applied in shop work. One of the projects supervised by the committee on high-speed milling is now being carried out at the California Institute of Technology under a contract between the Institute and the War Production Board. Because of the great value of this research to the war effort, operating personnel has been lent to the Institute by war plants on the Pacific Coast.

An example of the wide range of projects coming under the supervision of the Manufacturing Engineering Committee is the investigation of fused quartz now being conducted. The method and equipment under development provide a clear quartz, practically free from bubbles, with a high transmission factor. This quartz finds immediate application in the forming of cells and applicators used in producing serums and vaccines for the Armed Forces. Other problems that have been dealt with by the committee since its formation have had to do with the extrusion of steel shapes and the allowances required on forgings.

The committee invites inquiries as to how it can be useful to war production and industry in general. They should be addressed to the Manufacturing Engineering Committee, American Society of Mechanical Engineers, Room 802, 40 W. 40th St., New York 18, N. Y., or to the Industrial Processes Branch, Office of Production Research and Development, War Production Board, Washington, D. C.

HERE'S THE $64



Below: Ex-Cell-O designed and built Precision Way Machines turn out accurate metal parts on a high production basis (a few typical parts are illustrated). These single-purpose machines (in many cases made highly flexible by the new Ex-Cell-O type of bolted-section construction) frequently perform numerous operations in one setting and often bring a substantial increase in the number of parts produced hourly with improved quality and reduced unit cost.

Above: A typical application of an Ex-Cell-O Precision Boring Machine. This particular machine is a three-way type. The center section is designed to hold the part rigidly while the spindles are advanced, the holes being bored in exact relation to each other. The spindles have individual adjustments. The part shown here is a differential carrier steel casting, with two holes finish bored at each end and one from the rear, simultaneously. Each wing of the machine is individually set as to speed and feed with its own hydraulic feed panel. Once the most efficient speed and feed combination is reached, the whole machine is controlled by means of push-buttons, located for the operator's convenience. The machining cycle is automatic after the "start cycle" button is pressed.

EX-CELL-O CORPORATION

Spar-Milling a V-Shaped Cap Strip without Clamps

By ROY PARKINSON
Assistant Chief Tool Designer
Curtiss-Wright Corporation
Columbus, Ohio

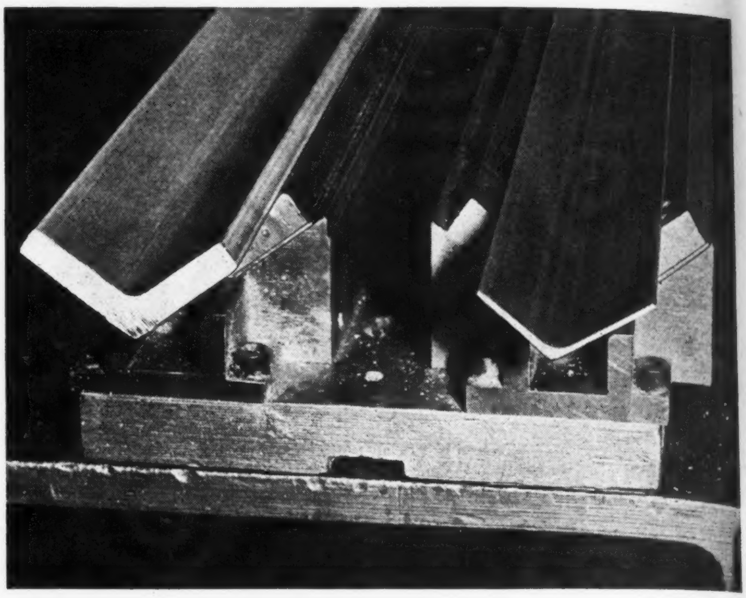


Fig. 1. Fixture Designed to Hold Two V-shaped Cap Strips Side by Side. Right-hand Cap Strip has been Milled; Left-hand Cap Strip has Not

EXTRUDED cap strips for Curtiss Helldiver dive bombers are being successfully spar-milled at the Columbus, Ohio, plant of the Curtiss-Wright Corporation without using manually operated or automatic air or hydraulic clamps to hold them in place. The parts are held rigidly on a supporting fixture by rollers that precede and follow the cutters. Any longitudinal movement of the cap strips is prevented by locating pins.

These cap strips are 108 inches long and are V-shaped with an open angle of 118 degrees. Each side of the vee is 1.375 inches wide and has a basic wall thickness of 0.288 inch. The outer surfaces of both sides have a convex curvature with an 11-inch radius. The material is 14 S-T aluminum.

In the milling operation, the inside surfaces of both sides of the cap strip are "climb-cut" for a distance of 74 1/2 inches. When this operation has been completed, the wall thickness of the cap strip at one end is 0.040 inch on both sides and increases to 0.080 inch over a distance of 2 1/2 inches. From this point, the thickness gradually increases in a straight taper over a distance of 72 inches up to the point where it equals the basic dimension of 0.288 inch.

The fixture is designed to hold two cap strips side by side for simultaneous milling, as shown in Fig. 1. In this illustration, a finished and an unfinished cap strip are shown. A curved contour is provided on the supporting fixture, so that each cap strip can be firmly seated on its curved outer surface.

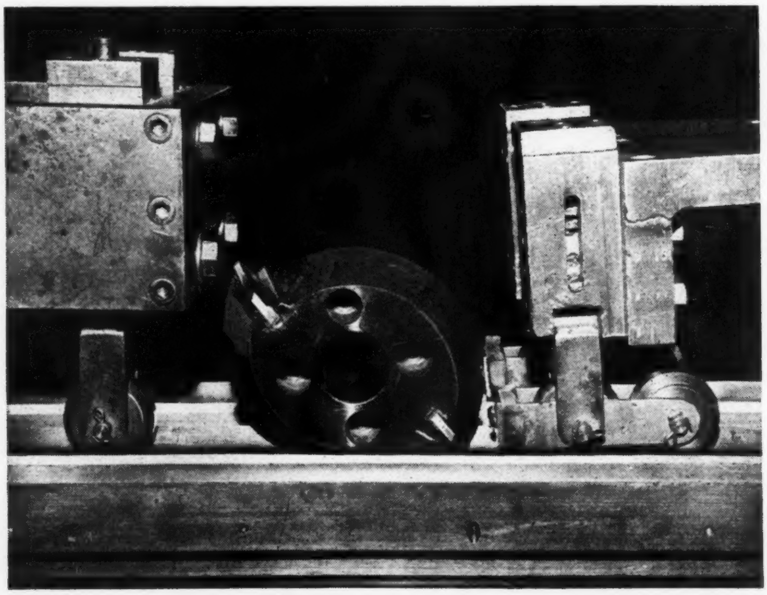
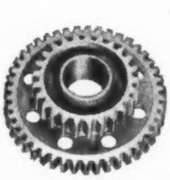


Fig. 2. Close-up View Showing Relation of Rollers to Cutter. (Cutter is Shown Unmounted to Give a Clearer Idea of the Relative Positions.) Front Rollers are at Left. Rear Rollers and Auxiliary Rollers that Control Position of Neoprene Wipers are at Right


"A-Q" (aircraft quality) Gears


Industrial Gears

Back in 1859 when Foote Bros. was founded, America was on the threshold of a mighty industrial development. At that time many foresighted planners looked to Foote Bros. for the solutions of their problems in mastering power.

As industry developed, the demand for increased speed, greater power and more efficient methods of transmitting that power grew. And Foote Bros. met these demands.

Looking forward to new horizons of power transmission, by 1940 Foote Bros. developed a revolutionary type of gear. This gear came closer to theoretical perfection than any before achieved. It took the exacting demands of laboratory technique and translated them into mass production.

Today these gears are being produced in the plants of Foote Bros. by the millions and are proving their value in the mighty aircraft engines that power so many of our fighting planes.

In the laboratory of Foote Bros. are other developments that promise better power transmission to industry after the war. Some of these are well on the road to mass production—others are little more than promising experiments.

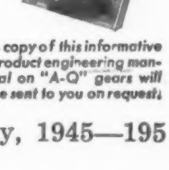
For your production today—for the equipment you are planning to manufacture in the future—the advanced engineering in power transmission developed in the laboratories of Foote Bros. may offer solutions to the problems you face.

FOOTE BROS. GEAR AND MACHINE CORPORATION, Dept. P, 5225 S. Western Blvd., Chicago 9, Ill.


Speed Reducers

FOOTE BROS.

Better Power Transmission Through Better Gears


A copy of this informative product engineering manual on "A-Q" gears will be sent to you on request.

A 3/8-inch reamed hole in that end of the cap strip which is machined last insures correct longitudinal location, and provides a means of holding the cap strip in a positive position without play during the climb-cut milling. About 3/4 to 1 inch extra length is provided at each end of the work for locating purposes. After all the machining operations have been completed, the cap strip is cut to its true length, removing the locating sections.

The work-pieces are held rigidly on the supporting fixture by the use of rollers that precede and follow the cutters horizontally, as shown in Fig. 2. The holding pressure is confined to the immediate area surrounding that being milled, so that it is necessary to have the rollers as close as possible to the cutters, approximately 3/8 inch clearance being provided.

Each roller is supported by a holder that contains a strong spring exerting a downward pressure of approximately 175 pounds on the roller. The holders are mounted rigidly on a sub-frame, which, in turn, is mounted rigidly on the main body of the machine carriage. The cutters can move up and down freely, but the rollers remain stationary with respect to the machine carriage. Both cutters and rollers move horizontally as a unit. In order to get the rollers up on the cap strips in the fixture, and at the same time build up the necessary holding pressure, a ramp is provided at each end of the fixture, as shown in Fig. 3.

Neoprene wipers in front of the rear rollers prevent chips from marring the finish. As shown in Fig. 2, an auxiliary roller is used in back of the rear roller. This roller raises the wiper as the main roller moves up the ramp onto the work-piece. As soon as the auxiliary roller reaches the top of the ramp, the wiper is brought down tightly against the work. The hold-down spring can be seen in the slot directly over the main rear roller.

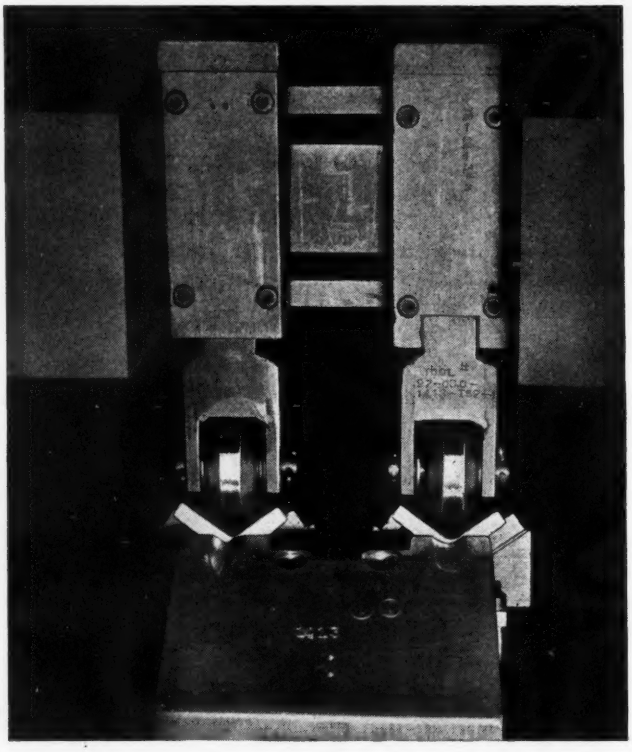


Fig. 3. End View of the Supporting Fixture, Showing Relation of the Ramp and Rollers

The cutter body is approximately 8 inches in diameter, and because of its heavy design acts as a flywheel, thus tending to eliminate vibration. Each cutter is balanced before use, and is flange-mounted for rigidity. The cutters have two carbide or tantung tips which are silver-soldered directly to the cutter body, as shown in Fig. 2. Tantung tips are used for short or experimental runs because of the low cost and higher speed of grinding. Carbide-tipped cutters are used for standardized designs and high production. The teeth have a 10-degree rake angle, 6-degree primary clearance angle, and 15-degree secondary clearance angle.

An excellent finish is produced with this spar-milling arrangement, and a tolerance of plus 0.005, minus 0.000 inch is maintained.

* * *

Right Cutting Oil Increases Production

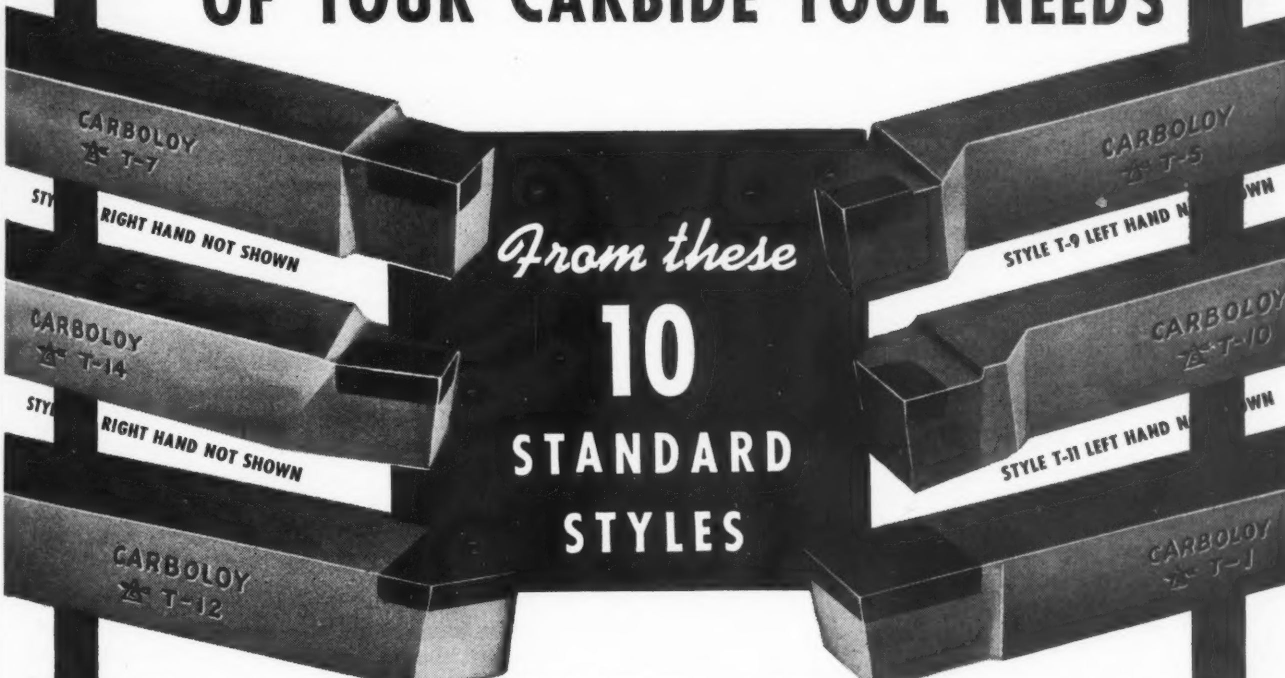
During the war period, thousands of plants throughout the country producing war equipment and materials have increased their production and obtained other worthwhile benefits by following the recommendations of the service engineers of the companies that provide their cutting oils. Many specific examples of increased production have been recorded. In one instance, according to the Gulf Oil Corporation, Pittsburgh, Pa., a large ordnance manufacturer found it necessary to reject 40 per cent of the production of 30-millimeter gun barrels because the reaming operations were not satisfactory. A service engineer recommended a slight change in machining practice and the proper kind of cutting oil. The result of the adoption of these recommendations practically eliminated rejections and doubled production.

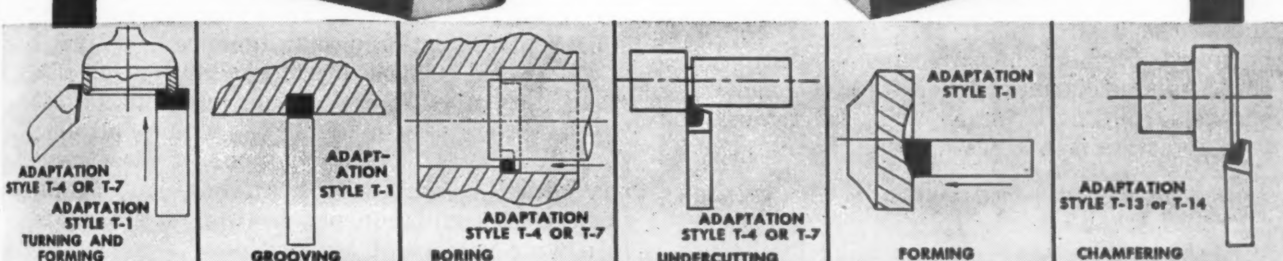
* * *

Standardized Welding Controls

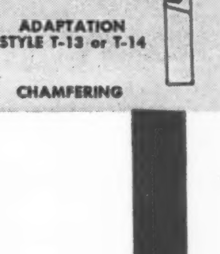
More than 150 different combinations of Westinghouse industrial resistance welding controls can be made from only eleven standard basic units. From these units, it is possible to assemble in the factory welding controls that will meet the diversified needs of industry, which in the past could only be met through individually designed and custom-built controls.

How to Get 60% to 80%
OF YOUR CARBIDE TOOL NEEDS





Standard Carboloy Tools are "master" styles carefully designed to meet most of your turning, facing, boring requirements. Widely used "as is", these standards may also be adapted to special requirements by quickly grinding to special shapes. A few of the many adaptations possible are shown in sketches above. With standards in your crib, you're prepared to "tool up" most jobs immediately without the necessity of stocking a large number of special tools.



For machining all metals and non-metallics, standard Carboloy Tools are priced as low as 70c each—actually lower than the price of ordinary tools in many sizes. Write for catalog GT-175R.

CARBOLOY COMPANY, INC. 11147 E. 8 MILE BLVD., DETROIT 32, MICHIGAN
Chicago • Cleveland • Houston • Los Angeles • Milwaukee • Newark • Philadelphia • Pittsburgh • Thomaston
Also Sold by Leading Mill Supply Distributors

Standard **CARBOLOY** TOOLS
TRADEMARK

Economic Factors in Electronic Heating

The technical advantages offered by electronic heating for certain types of applications were discussed at some length in the article entitled "Electronic Heating of Metals and Non-Metallic Materials," published in March, 1945, MACHINERY, page 147. It should be pointed out in that connection that these technical advantages in some cases may be outweighed by certain economic factors.

As R. M. Baker and C. J. Madsen have pointed out:* "The heat units produced by high-frequency technique are the same form of energy as obtained from conventional sources. It can be expressed as B.T.U. or calories, as well as watt-hours. The main difference is in the method of introduction into the material to be heated. Any heating process requires a certain amount of useful energy, regardless of the source of this energy. Electrical energy, in itself, is not a cheap source of heat, and additional losses are encountered in the conversion of conventional-frequency electrical energy into electrical power of high frequencies. This results in a relatively high cost, which must be offset by some advantage not obtainable by other methods.

"The high cost appears in two ways—first cost of equipment and cost of operation. To illustrate these factors, two curves are presented. Fig. 1 shows the approximate first cost of high-frequency equipment of two types—rotating machines and electronic generators. Considerable spread is indicated for a particular rating, due to the variation in accessory equipment, such as voltage regulators, application electrodes or coil, etc., necessary for various types of processes.

*"High-Frequency Heating of Conductors and Non-Conductors," R. M. Baker and C. J. Madsen, "Electrical Engineering," February, 1945.

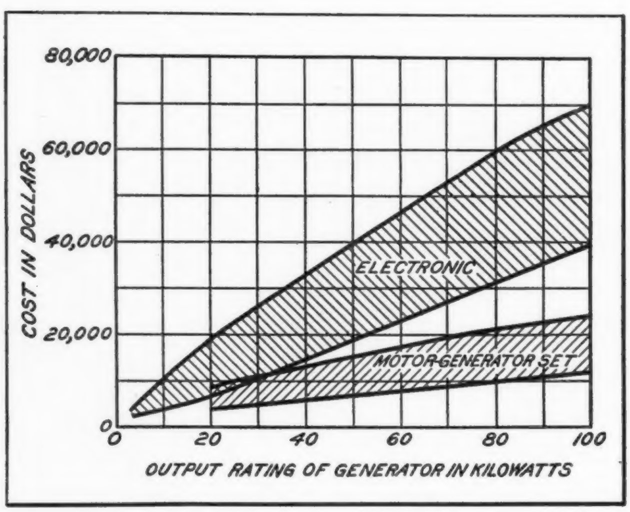


Fig. 1. Comparison of Cost of Motor-generator and Electronic High-frequency Generator, Including Accessories

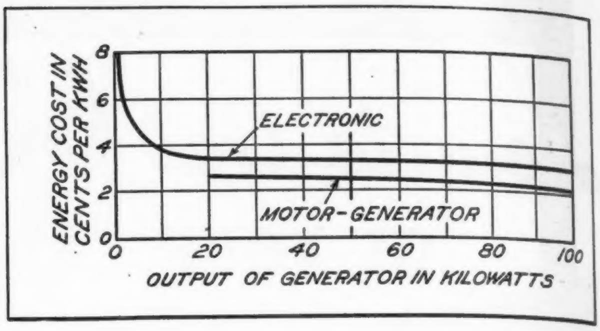


Fig. 2. Comparison of High-frequency Energy Cost, Including Tube Replacement, Maintenance, Amortization, Power, etc., for Electronic and Motor-generator Equipment

"On applications in which frequencies of less than 10,000 cycles can produce the desired rate or depth of heating, rotating machines are quite satisfactory. In fact, the economic picture at present is such that electronic generators are seldom applied at frequencies of less than 100,000 cycles. The cost of high-frequency energy (in terms of kilowatt-hours) as obtained from rotating machines is somewhat lower than that obtained from electronic generators, as indicated by Fig. 2. (These curves are based on electrical energy at one cent per kilowatt-hour, amortization over ten years, and average tube replacement and maintenance.)

"These costs place electronic equipment at a disadvantage, except where technical limitations preclude the use of machine frequencies or other sources of heat. The limitations of these more conventional sources of heat, however, permit the use of high-frequency heating to advantage in a wide variety of applications."

* * *

Air-Fed Welding Helmet

To give welders complete relief from obnoxious fumes, a new air-fed welding helmet has been designed by a group of doctors and safety engineers. This helmet was originated by the Pullman Standard Car Mfg. Co., Chicago, Ill., with the aid of the Northwestern University Medical School.

Clean, fresh air is fed into the helmet through a supply tube encircling the lens-holder. Air constantly circulates within the helmet, but in such a way that there is no draft. The flow of the fresh air prevents fume-laden air from entering, the heat is reduced, and the welders work in greater comfort. The new helmet is being made by the Chicago Eye Shield Co., 2300 Warren Blvd., Chicago 11, Ill., under the name "Cesco Air-Flow" welding helmet.

Shop Equipment News

Machine Tools, Unit Mechanisms, Machine Parts, and Material-Handling Appliances Recently Placed on the Market

Oster Improved "Rapiduction" Screw Machine

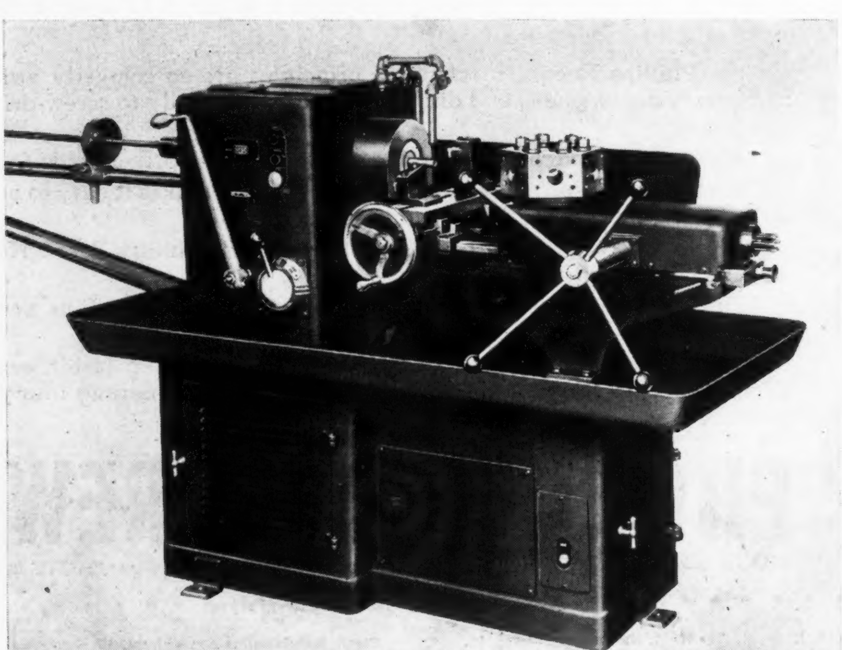
The Oster Mfg. Co., 2073 E. 61st St., Cleveland 3, Ohio, has recently brought out an improved No. 601 "Rapiduction" screw machine, designed to handle a wider range of work and to meet the demands for higher production rates. Features made available on this new machine to meet specific requirements include either worm drive or direct V-belt drive to the machine spindle; automatically indexed six-station turret or a plain saddle with single post; four-speed motor, which permits four changes in speed without changing sheaves, or a two-speed motor.

Other new developments incorporated in this machine include oil-resistant rubber motor mounting, designed to insure smooth, quiet operation; individual 1/8-H.P. motor drive for coolant pump, provided to insure uniform flow of cutting lubricant regardless of changes in spindle speeds; new electrical controls with conveniently located speed selector switch; and longer, heavier base, which gives increased rigidity.

This machine has a swing of 14 inches over the bed and of 6 1/2 inches over the cross-slide. It will handle round bar stock up to 1 1/2 inches in diameter, and can be equipped with a special spindle to accommodate air-operated chucks or mandrels.

The direct drive from motor to spindle for use on small-diameter high-speed work makes it possible to obtain spindle speeds ranging up to 3000 R.P.M. The hardened and ground steel worm of the worm drive is mounted in ball bearings, and is designed to transmit a smooth, even flow of power to the spindle through a bronze worm-wheel. The interchangeable motor and sheaves that can be furnished with the worm drive provide for spindle speeds ranging from 71 to 1034 R.P.M.

The ways of the bed are 36 inches long and 1 1/2 inches wide. The cross-slide is 18 7/8 inches long by 5 1/4 inches wide, and has a lever-feed travel of 4 1/2 inches and a screw-feed travel of 6 1/2 inches. The hexagonal turret is 8 1/2 inches across flats, and has turret tool holes 1 1/2 inches in diameter. The effective turret travel at one setting is 7 inches, and the maximum distance from spindle nose to turret face is 16 1/2 inches. The turret saddle has a maximum travel on the ways of 11 inches. The machine requires a floor space of 38 by 80 inches, and with turret and bar feed weighs 1710 pounds.......51



Oster Improved "Rapiduction" Screw Machine in which New Developments have been Incorporated

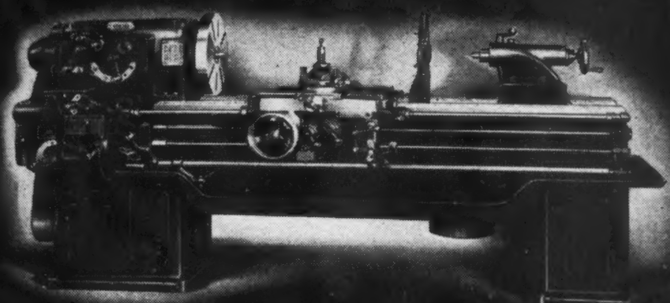
Solid Bit Cutting Tool

A new solid cast-steel cutting tool which is produced by melting a special cobalt steel alloy in an indirect arc, rocking type electric furnace, superheating to well above 3000 degrees F. and casting in molds of the approximate tool size, is being introduced to the trade by Crobalt, Inc., 1374 N. Main St., Ann Arbor, Mich. The process used in the production of these tools, which are designated "Powersteel," eliminates forging and subsequent heat-treatment.

It is claimed that these tools will retain their cutting ability on many types of work several times longer than has previously been considered possible, and that cutting speeds can safely be increased by 20 per cent. It is emphasized, however, that Powersteel tool bits are not recommended as a solution for difficulties experienced in all kinds of metal-cutting work. The specific types of work to which they are

To obtain additional information on equipment described on this page, see lower part of page 182.

Sidney Lathes



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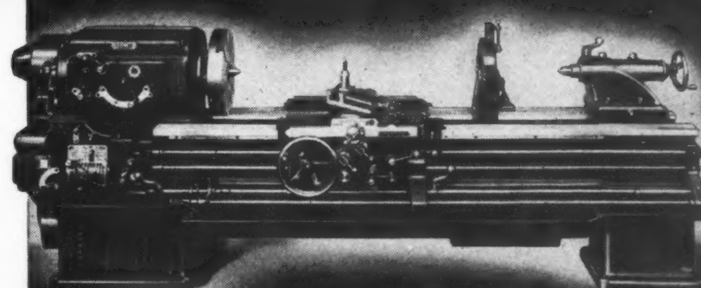


Sidney Lathes

. . . are built in a wide range of capacities from 14″ to 36″.

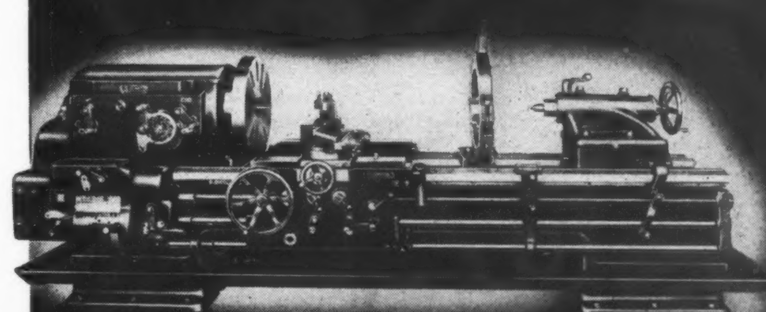
All of these models feature continuous tooth Herringbone gearing not only well known but recognized for the greater strength and smoother action resulting from greater tooth contact.

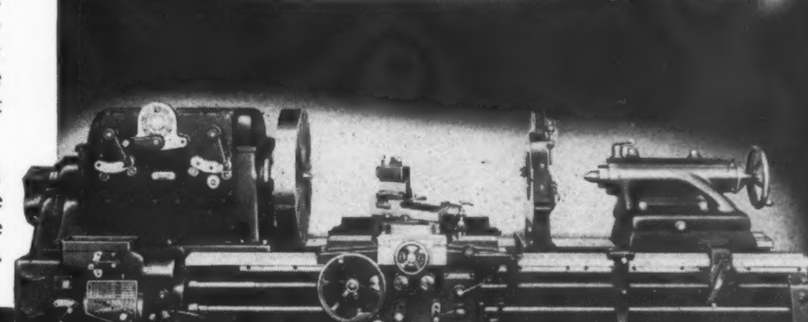
Sidney continuous tooth Herringbone gears are generated and lapped in our own plant to assure the utmost accuracy and smoothest possible finish.

This gearing not only affords greater, smoother power on all sizes but results in highly finished, accurate work free of all tooth marks.

The Headstock is particularly quiet in operation with both spindle and intermediate shaft supported by a center bearing. Internal and external gear tooth clutches operating on multiple spline shafts reduce backlash to a minimum and permit of easy engagement.

For power, speed and continued accuracy Sidney Lathes offer the utmost in dependable lathe performance. Bulletins available.





The SIDNEY MACHINE TOOL Company

Builders of Precision Machinery

SIDNEY — ESTABLISHED 1904 — OHIO

best suited have been determined after an exhaustive series of tests.

These solid tool bits are supplied hardened and ground, ready for use. They can be resharpened and used as long as the tool can be gripped in its holder. They require no change in existing equipment or shop practice, and are available from stock in nine standard sizes of square bits and five sizes of rectangular bits. 52

Electrically Powered Device for Crush Dressing Wheels for Precision Thread Grinding

A crush dressing device with electric motor drive designed for forming the wheel used on the precision thread and form grinders made by the Sheffield Corporation, Dayton 1, Ohio, has been developed by engineers of that company. It is available in two styles, either of which can be applied to new machines or to those now in use.

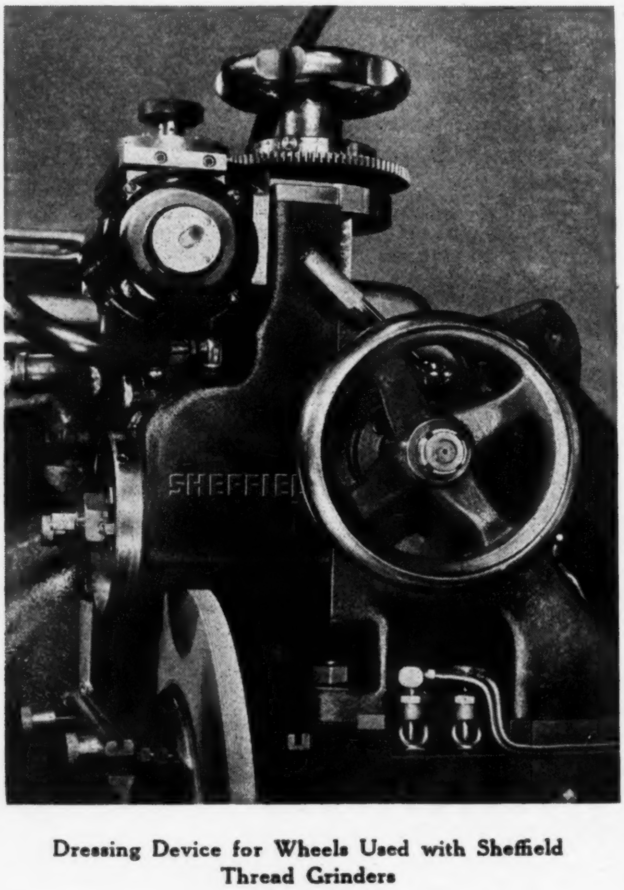
With the Model A device, the operator presses a button after the crusher roll has been manually lowered into contact with the grinding wheel, which is revolved at grinding speed. The coolant flow is directed over the crusher roll as it is fed by power into the wheel at a constant rate until the feed indicator dial on the crushing device indicates that the desired depth of dressing has been reached. The operator then releases the pressure on the push-button, stopping the wheel, the crusher in-feed, and the flow of coolant, after which the crusher is lifted out of engagement with the wheel. Grinding of the threads is then continued.

In the case of the Model B device, operation is semi-automatic, being distinguished from that of Model A in that the feed dial indicator is preset for the desired depth of automatic in-feed of the crusher roll. After removal of the wheel guard and lowering of the crusher roll into contact with the wheel, the closing of an electric switch starts the cycle of coolant flow, crushing wheel rotation, and the feeding of the crusher into the wheel. The automatic cycle continues until the desired depth of in-feed is reached, at which point the flow of coolant, the in-feed of the crusher, and the rotation of the grinding wheel are automatically stopped. The operator then manually returns the crusher roll to the upper position and continues the grinding work. 53

"Wheelabrator" Swing Table for Metal Cleaning and Finishing

Several new models of metal cleaning and finishing machines have been added to the line of "Wheelabrator" swing tables manufactured by the American Foundry Equipment Co., 555 S. Byrkit St., Mishawaka, Ind. These new models with Wheelabrator airless abrasive blasting units make it possible to apply the speed and economy of airless blast cleaning to a wide range of intricate or irregular-shaped work formerly cleaned in air-blast rooms.

Four sizes of this blast cleaning machine are now available with



Dressing Device for Wheels Used with Sheffield Thread Grinders

New Model "Wheelabrator" for Metal Cleaning and Finishing

To obtain additional information on equipment described on this page, see lower part of page 182.

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MACHINERY'S DATA SHEETS 537 and 538

SPINDLE NOSES AND ARBORS FOR MILLING MACHINES—3

Approved by American Standards Association, November, 1943

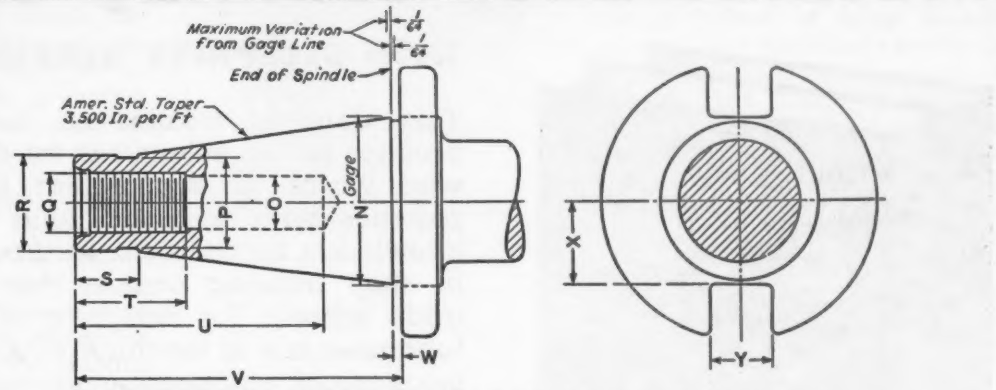

Table 3 Essential Dimensions for Ends of Arbor and Adapter

Size Number	Gage Diameter of Taper N	Drill Clearance for Draw-In Bolt O	Diameter of Neck P	Size of Thread for Draw-In Bolt Q	Pilot Diameter R	Length of Pilot S	Length of Perfect Threads T	Depth of Clearance Hole U	Distance from Rear of Flange to End of Arbor V	Clearance of Flange from Gage Diameter W	Depth of Driving Slot X	Width of Driving Slot Y
30	1 1/4	27/64	41/64	1/2-13	0.675 0.673	13/16	1	2	2 3/4	1/16	0.640 0.625	0.630 0.640
40	1 3/4	17/32	15/16	5/8-11	0.987 0.985	1	1 1/8	1 15/16	3 3/4	1/16	0.890 0.875	0.630 0.640
50	2 3/4	7/8	1 1/2	1-8	1.549 1.547	1	1 3/4	3 1/2	5 1/8	1/8	1.390 1.375	1.008 1.018
60	4 1/4	1 7/64	2 9/32	1 1/4-7	2.361 2.359	1 3/4	2 1/4	4 1/4	8 5/16	1/8	2.400 2.390	1.008 1.018

All dimensions are given in inches.

MACHINERY'S Data Sheet No. 537, May, 1945

MAXIMUM PERIPHERAL SPEEDS OF GRINDING WHEELS, IN FEET PER MINUTE

Approved by American Standards Association, September 1, 1943

Types of Wheels	Vitrified and Silicate Bonds			Organic Bonds		
	Soft	Medium	Hard	Soft	Medium	Hard
*Type 1—Straight Wheels (Including plate-mounted and inserted-nut wheels) *Type 4—Taper Wheels	5500	6000†	6500	6500	8000	9500
*Types 5 and 7—Recessed Wheels	5500	6000†	6500	6500	8000	9500
*Type 2—Cylinder Wheels (Including plate-mounted and inserted-nut wheels)	4500	5500	6000	6000	8000	9500
**Dovetail Wheels *Types 11 and 12—Dish and Flaring Cup-Wheels Type 13—Saucer Wheels	4500	5500	6000	6000	8000	9500
*Type 6—Deep Recessed Cup-Wheels	4500	5000	5500	6000	7500	9000
‡Cutting Wheels Larger than 16" Diameter	....	....	....	....	....	7500 to 14,000§
‡Cutting Wheels 16" and Smaller	....	....	....	....	....	10,000 to 16,000§
Thread Grinding Wheels on Standard Machines	8000	10,000	12,000	....	....	12,000
Automotive and Aircraft Crank Grinding on Standard Machines	....	7300	8500	....	....	......
Automotive and Aircraft Cam Grinding on Standard Machines	....	8000	8500	....	....	......
Diamond Wheels (all types)	Any Bond—Maximum 6500					

When wheels of unusual and extreme shapes, such as deep cups with thin walls or backs, long drums, or wheels with large center holes are required, consult wheel manufacturer for speeds. Maximum speeds indicated are based on the strength of the wheels and not on their cutting efficiency; best speeds may sometimes be considerably lower.

*Standard shapes. **Non-standard shapes. †On precision machines, vitrified and silicate wheels in medium grades may be operated at 6500 peripheral feet per minute. ‡A cutting wheel is an organic bonded wheel, the thickness of which is not more than 1/48 of its diameter for wheels up to 20 inches in diameter, and not more than 1/60 of its diameter for wheels larger than 20 inches in diameter. Wheels of this kind are used for such operations as cutting-off, grooving, and slotting metals. §Depending upon stability and design of machine.

MACHINERY'S Data Sheet No. 538, May, 1945

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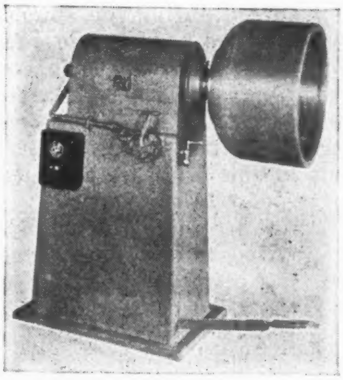
single work-tables 24, 66, 72, and 86 inches in diameter. Operation of the four units is essentially the same, the machines varying only in minor construction details and in the number of Wheelabrator units utilized. The work to be cleaned is placed upon a rubber-covered work-table mounted on the door of the blast cabinet. As the door is closed, the work-table swings into the cabinet under a Wheelabrator airless blast unit. While in this position, the table is rotated at a predetermined speed. The Wheelabrator unit discharges or whips a continuous stream of abrasive down upon the rotating work for the full width of the table, so that all surfaces are uniformly blasted to a bright, clean finish.

A very short exposure of the parts to the Wheelabrator unit serves to clean the exposed surfaces thoroughly and uniformly. The Wheelabrator is then stopped, the door swung open, and the part turned over for cleaning on the under side. After striking the work, the abrasive falls through perforations in the table top into a hopper below the machine. A screw type conveyor transfers the abrasive to the elevator section from which it is carried to an overhead separator. All broken down and useless abrasive is removed and the usable abrasive is allowed to fall into a storage hopper. An important feature of this machine is that all blast-cleaning operations are performed within the cabinet, thus protecting the operator.......54



Schauer Variable-speed Polishing Lathe with Vacuum Work-holding Fixture

Variable-Speed Polishing Lathe

A heavy-duty, variable-speed polishing lathe with vacuum holding fixtures which make possible speedy, simultaneous polishing of the entire surface of the work has been brought out by the Schauer Machine Co., 2045 Reading Road, Cincinnati 2, Ohio. With this machine, known as Type VA3BC-V, the part to be polished is revolved instead of being brought up against a revolving abrasive or polishing wheel. A wide range of vacuum type holding fixtures can be used, each fixture being designed to hold a particular piece. This type of fixture will not mar or distort the part, as is sometimes the case when mechanical holding fixtures are employed. It is especially adapted for use in polishing and finishing cooking utensils, bowls, kettles, reflectors, etc.

The machine is equipped with a motor which operates continuously; single foot-pedal control for clutch and brake; and a large disk type brake. The motor is coupled to the work-spindle by a "Twin-Disc" clutch assembly and a Reeves variable-speed drive. Infinitely variable speeds ranging from 100 to 4800 R.P.M. in the ratio of 6 to 1 or 12 to 1 are available.......55

Elgin Bench Lathes and Screw Machines with New Pedestal Base

The Elgin Tool Works, 1770 Berteau Ave., Chicago 13, Ill., has developed a new pedestal type base which is now being applied to Elgin lathes and screw machines as shown in Figs. 1 and 2. All dimensions and details of the machines are the same as for the previous model with standard column construction. The outstanding feature of the new pedestal is the knee space and footrest rail, which enable the operator to assume a comfortable working position at the machine. This feature makes these machines especially well adapted for use by women operators.

The pedestal of the lathe shown

Fig. 1. Elgin Lathe with New Pedestal Base Designed to Permit Operation from Comfortable Sitting Position

Fig. 2. Rear View of Elgin Screw Machine with New Pedestal and Coolant System

To obtain additional information on equipment described on this page, see lower part of page 182.

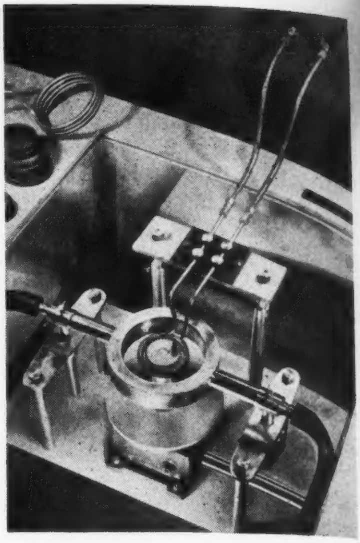
in Fig. 1, in addition to housing the motor drive, has a collet rack inside the door. At the right-hand end of the base there is a cupboard with three shelves that provide storage space for tools and equipment.

In the rear view of the screw machine shown in Fig. 2 may be seen the independent coolant tank provided, which has a capacity of 5 gallons. This tank, being outside the column of the machine, is easy to fill, drain, and clean. An important advantage obtained by this arrangement of the cooling system is that it prevents the coolant from entering the machine base. The coolant pump is driven by a separate motor, mounted on the tank as shown. 56

Lepel High-Frequency Roto-Heating and Quenching Unit for Hardening Gears

In order to enable users of the high-frequency induction heating process to secure full benefits from its use in hardening such parts as gears and pinions, the Lepel High Frequency Laboratories, Inc., 39 W. 60th St., New York 23, N. Y., has recently developed a new roto-heating and quenching unit. This device causes the part to revolve at a predetermined speed within the load coil during the automatically controlled heating and quenching cycles. It is claimed that a degree of uniformity never previously achieved by any hardening process and a new standard of quality for parts of this kind are obtained by the use of this equipment.

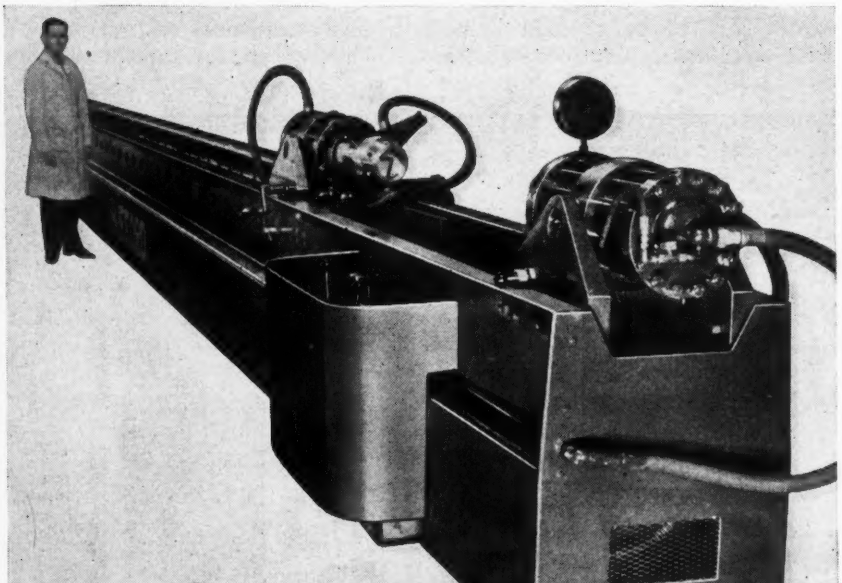
The entire unit, including the motor drive, load coils, and quench rings, is compact and light in weight. It can be operated in connection with any standard Lepel induction heating unit. It enables localized hardening to be confined to the tooth wearing surfaces, and permits the untreated areas to retain the full toughness and ductility of the steel. It is claimed that in the short time required to bring the part to quenching temperature, practically no grain growth or surface decarburization takes place. The result is an extremely hard long wearing surface. The time required for hardening is also reduced to a matter of seconds, and as there is practically no distortion or scaling, little or no finishing is needed after quenching. 57



Roto-heating and Quenching Unit for Hardening Gears

Hufford Hydraulic Straightening and Stretch-Forming Machine

A new hydraulic stretch-leveling machine has been developed by the Hufford Machine Works, Inc., 207 North Broadway, Redondo Beach, Calif., for permanently straightening and leveling long narrow metal sections that are twisted, bent, or otherwise distorted after they have undergone rolling or heat-treating operations. This machine is especially adapted for use in straightening rolled and extruded metal sections, aircraft fuselage stringers, railroad-car structural members, bus-body parts, boat frames, and similar members that must be straightened prior to forming or "degreeing" operations.

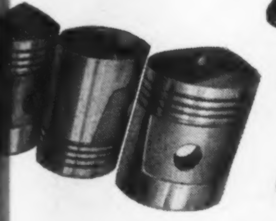


Hufford Hydraulically Operated Machine for Straightening and Stretch-forming Long, Narrow Metal Sections

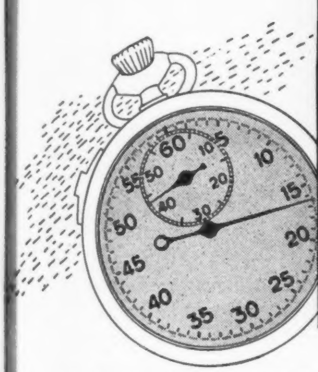
The new machine has been designed to provide a fast, simple, and efficient operating cycle, and to handle sections of many different materials and shapes in lengths up to 40 feet. In addition to straightening the stock by establishing a "set" in the metal through a slight predetermined stretching of the material, this machine can also be used in conjunction with a die for stretch-forming the work to contours up to 30 degrees. Operation of the machine is extremely simple, all control over straightening and stretch-forming operations being grouped in a central control panel.

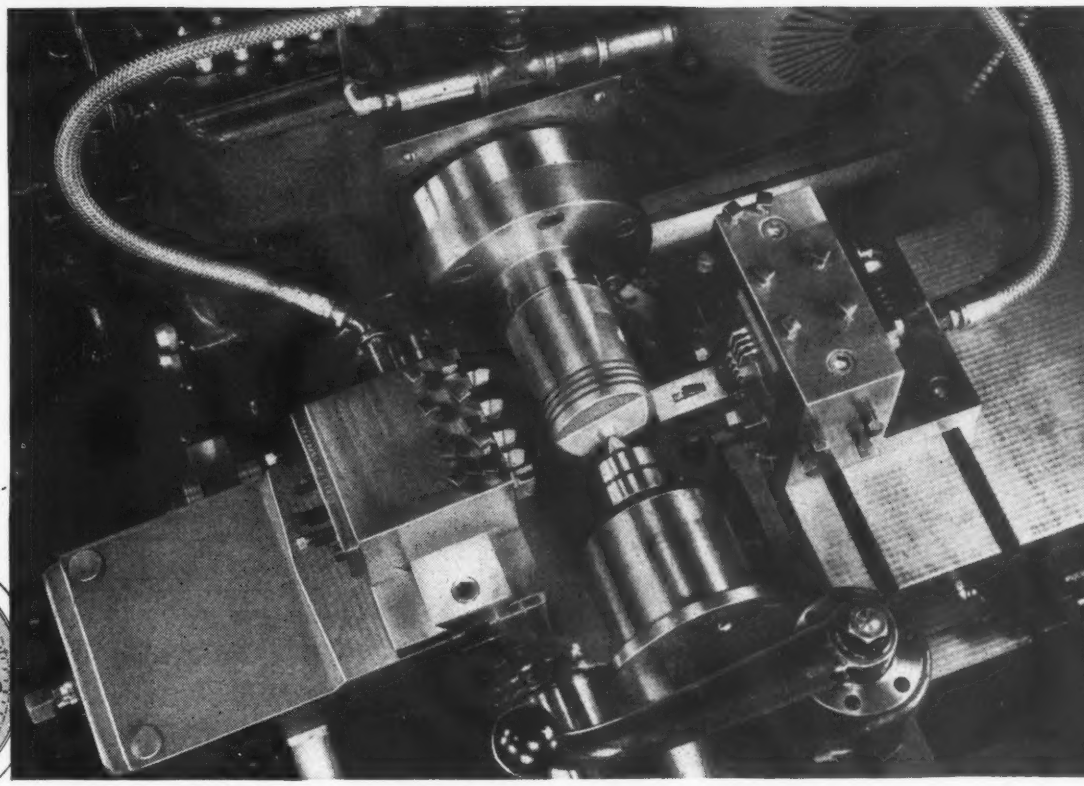
The machine has a pull capacity of 40 tons, with a 19-inch stroke on each hydraulic piston, but it can be built in higher or lower capacities to meet varying straightening requirements. It consists essentially of two hydraulically operated tension cylinders, mounted in

To obtain additional information on equipment described on this page, see lower part of page 182.



3 pistons per minute!





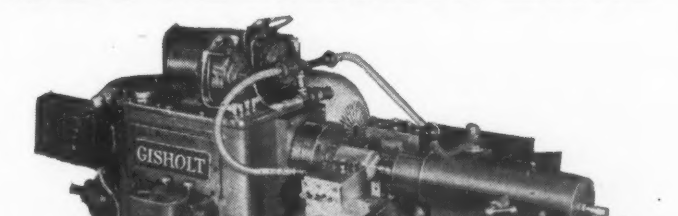
with the GISHOLT HYDRAULIC AUTOMATIC LATHE

This manufacturer, with aluminum pistons to turn out in large numbers, properly assigned the job to the Gisholt No. 12 Hydraulic Automatic Lathe. With the tool set-up shown here, the finish turning and grooving were done at a rate of 180 per hour, net.

Naturally, this calls for high spindle speeds; smooth, even feeds; quick approach and automatic return traverse of tools; easy operating tailstock, and an air-chucking fixture.

Those are the important things about the Gisholt Hydraulic Automatic Lathe. It's flexible, adaptable, fast... ready to handle a variety of between-centers or chucking work. And it's so easy to run that the operator has little to do but load the chuck, and remove the work when finished.

The Gisholt No. 12 means rock-bottom costs wherever the volume is sufficient to warrant automatic machining. Literature on request.



THE GISHOLT NO. 12 HYDRAULIC AUTOMATIC LATHE provides independent feeds for front carriage and rear slides, with an infinite selection of feeds from .000" to .055". Slides feed to positive stops, insuring utmost accuracy in finished dimensions. Elimination of feed gears, mechanical trips, cams, etc., greatly simplifies changes of setup.

GISHOLT MACHINE COMPANY
1209 East Washington Avenue • Madison 3, Wisconsin

Look Ahead... Keep Ahead... With Gisholt Improvements in Metal Turning

GISHOLT

TURRET LATHES • AUTOMATIC LATHES • BALANCING MACHINES • SPECIAL MACHINES

sturdy steel brackets which, in turn, are attached to a long massive steel bed. The tension cylinder at the control end of the table is stationary, while the opposing cylinder is adjustable along the length of the table in 5-inch increments to accommodate work of various lengths. Both cylinders can be tilted upward to a maximum of 30 degrees for stretch-forming work, and are actuated and positioned by means of small auxiliary cylinder assemblies. The piston-rods are equipped with air-operated gripper jaws, which are designed to hold the work securely and yet avoid "freezing." 58

Sheffield Internal Measuring Instrument

The new Model N-5 comparator type internal measuring instrument recently announced to the trade by the Sheffield Corporation, Dayton 1, Ohio, embodies both mechanical and electrical principles. It is equipped with an electric gaging head known as the "Electrigage," having an amplification of 2500 to 1, which was developed jointly by research engineers of the Sheffield and Westinghouse companies. This precision measuring instrument can also be furnished with other amplification ratios on special order.

The new type of electrical magnification employed causes instantaneous action of the indicator hand, and thus gives a quick, positive reading. There is no lag, and the stylus has a feather touch, so that gaging pressure need never exceed three ounces. A fine-adjustment knob is used to obtain a zero setting, and an automatic stabilizer prevents voltage variations from affecting the accuracy of readings.

Normally this instrument is used at the bench for inspecting work or parts received, and in the tool-room or laboratory for checking master and working ring gages, setting snap and length gages, and checking tools or other high precision work having one or more internal dimensions. Precision blocks or masters are used as a reference in setting up the instrument. A limit switch arrangement operating two red signal lights assists the operator in making the set-up and in properly positioning the work for checking.

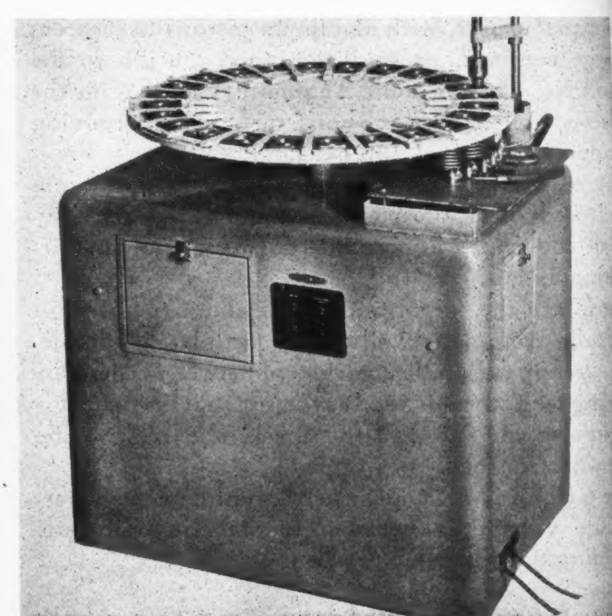
The gaging range includes minimum and maximum gaging diameters of 0.370 inch and 12 inches, respectively. The surface plate is adjustable for checking holes to a depth of from 1/16 inch to 1 1/2 inches. It is possible to explore a hole 3 inches deep throughout for diameter, taper, bell-mouth, and out-of-round conditions. The instrument can also be supplied with special gaging arms for checking holes down to and including 0.240 inch in diameter. The maximum gaging depth from the surface plate to the center of the diamond points on these arms is 1 inch.

All critical and exposed parts are chrome-plated to insure longer life, and tungsten carbide is used at points of contact to minimize wear. The linear scale is of the balanced type, having a total range of 0.0012 inch. The distance between the smallest graduations representing 0.00005 inch is approximately 1/8 inch, so that measurements to 0.000025 inch can be easily estimated on the scale...... 59

High-Frequency Induction Brazing Equipment with Indexing Work-Carrier

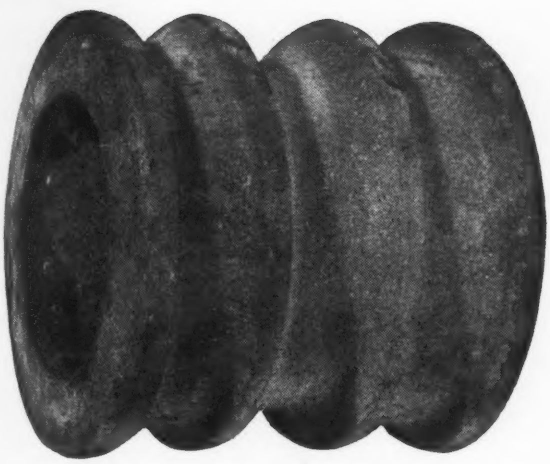
The Scientific Electric Division of the S Corrugated Quenched Gap Co., 107-119 Monroe St., Garfield, N. J., has mounted a new twenty-four-station circular indexing carrier on one of the company's 18-kilowatt electronic high-frequency generators for use in brazing metal assemblies. A completely brazed assembly is ejected from the carrier of this equipment every twelve seconds. The operator's activities

Comparator Type of Internal Measuring Instrument Brought out by the Sheffield Corporation



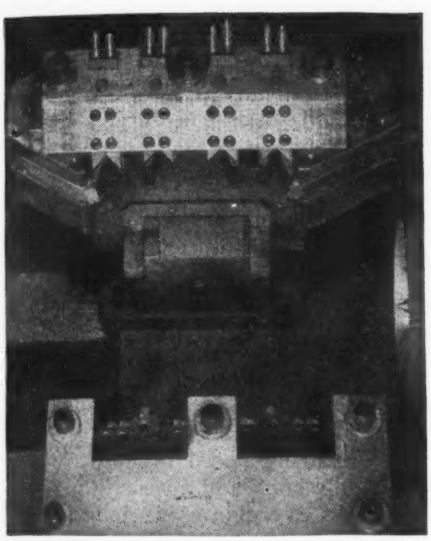
Induction Brazing Equipment Made by Scientific Electric Division of the S Corrugated Quenched Gap Co.

To obtain additional information on equipment described on this page, see lower part of page 182.

FROM THIS . . . . TO THIS

IN 4 MINUTES (Floor to Floor Time)

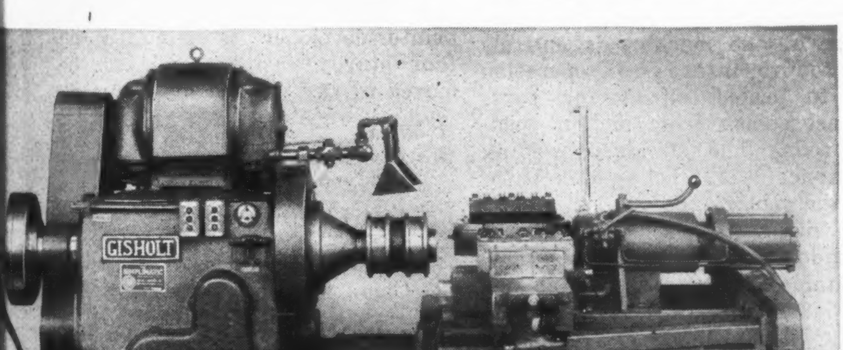


Here's another good example of the way a large number of surfaces can be machined at one time. Gisholt's versatile design permits many variations with two or more heavy duty slides, each with its own drive, its own rate and direction of feed. Yet, all are driven from and accurately timed with the spindle.

These track rollers are machined with 24 carbide tipped tools on 3 slides. Actual cutting time is 2½ minutes using over 40 H.P. Loading, unloading, etc., require 1½ minutes. Total time, floor to floor: 4 minutes.

THE GISHOLT SIMPLIMATIC

The machine shown here is equipped with an expanding arbor operated by a 16″ air cylinder; has a tailstock and three tool slides. It is tooled to machine two sizes of two different types of track rollers. All machine functions are automatic, operated by a single control. An operator can normally tend several Simplimatics. If large volume, low cost machining interests you, write for information about Gisholt Automatic Lathes.



GISHOLT MACHINE COMPANY
1209 East Washington Avenue
MADISON 3, WISCONSIN

Look Ahead... Keep Ahead... With Gisholt Improvements in Metal Turning

GISHOLT

TURRET LATHES • AUTOMATIC LATHES • BALANCING MACHINES • SPECIAL MACHINES

are limited to loading the empty stations as they pass him.

Heat is applied by a set of three water-cooled induction coils located under three of the work positions. The coils are followed by the vertically operated ejecting mechanism. The carrier is driven by a small motor. A carrier of this type can be applied to any of the company's electronic generators having a rating of 5 to 100 kilowatts.__60

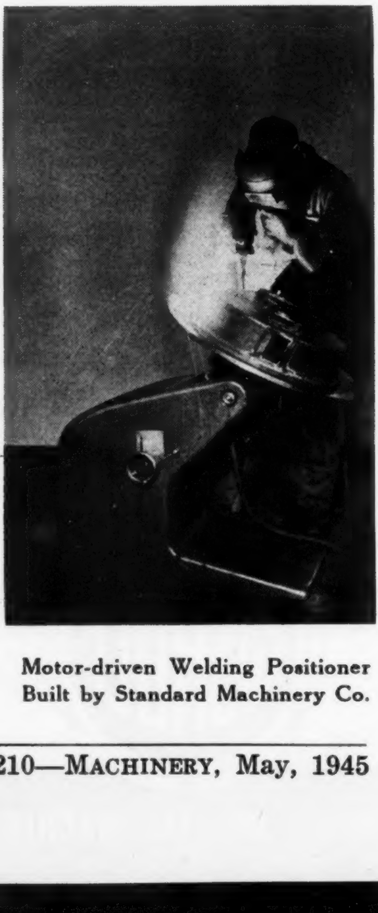
Bruning Printer and Developer for Black and White Prints

Variable-Speed Motor-Driven Multi-Purpose Welding Positioner

A motor-driven welding positioner has just been placed on the market by the Standard Machinery Co., Providence 7, R. I., which is designed for rotating work up to 700 pounds in weight in either direction at speeds from 0 to 2.4 R.P.M. The unit can also be used at a speed of 180 inches per minute with a work radius of 1 foot. Adjustments for linear speeds at all radii can be easily made, and are indicated on a scale located on the side of the positioner frame.

Operation of the positioner is easily controlled by means of a handwheel. To obtain a certain welding speed, it is only necessary for the operator to note the approximate radius at which the welding is to be done and to move the control wheel until the indicator is opposite the desired welding speed in the scale column for that particular radius. For special or sequence welding, provision is made for positively starting, stopping, or reversing the table.

The machine has proved adaptable for moving work past the torch and the quenching medium used in flame-hardening operations. The table can be removed to permit various jigs to be attached directly to the spindle. Work can also be mounted on the positioner table and tilted to any angle to facilitate the inspection of parts or assemblies from one operating position.



Motor-driven Welding Positioner Built by Standard Machinery Co.

Although the table was originally designed for use as a support for parts to be welded, and is only 28 inches in diameter, it can be utilized as a source of power for moving fixtures and work across machine tool tables for sequence operations. The positioner is provided with a new built-in variable-speed transmission and hydraulic cylinder for definite power control with a single 1/2-H.P., 110-, 220-, or 550-volt electric motor. No belts or clutches are employed, instantaneous starting, stopping, and reversing being accomplished by a foot-operated switch, which controls the driving motor.

The table can be tilted to an angle of 135 degrees from a horizontal position by means of a hydraulic cylinder and gear segments controlled by a spring-centered handle, which the operator moves through an angle of approximately 45 degrees in the direction of the desired table movement. The mechanism of the machine is entirely enclosed to insure safe operation and to protect all moving parts against splash from molten welding rods. The standard welding positioner is 32 inches long without the motor, and 39 1/2 inches long with the motor. It is 19 inches wide and weighs 665 pounds. The table is 28 inches in diameter and 5/8 inch thick. ____61

Bruning Printer-Developer for Black and White Prints

To provide simple, economical printing and developing facilities for those who require black and white prints in medium quantities, the Charles Bruning Co., Inc., 4754 Montrose Ave., Chicago 41, Ill., has brought out a new Model 41 printing and developing machine which combines individual printing and developing units in a cabinet of pleasing appearance. This machine has a maximum printing speed of 6 feet per minute, depending on the transparency of the original copy, and will print either roll stock or cut sheets with printing widths up to 46 inches.

The light source is a 2000-watt glass mercury vapor lamp within a 6-inch diameter cylinder. Uniform distribution of light is assured over the entire printing area of the cylinder. A new method of cooling draws the air into and through the cylinder and contact bands.

The printing speed is controlled by a single knob and an easily read dial. Flat dry prints are delivered at the front of the machine within easy reach of the operator. The printer-developer is mounted on four sturdy casters, and can be moved to any desired location.__62

New Twin-Fluted Countersinks

The Grobet File Co. of America, 421 Canal St., New York 13, N. Y., has recently added a set of eight twin-fluted countersinks to its line of chatterless countersinking tools. This set has a full range of six sizes, with duplicates in two sizes. These fast-cutting, twin-fluted countersinks are recommended for use on aluminum, magnesium, steel, plastics, plywood, etc. They give a very smooth finish and are adapt-

To obtain additional information on equipment described on this page, see lower part of page 182.


H.Q.
FOR SMALL WHEELS
Whether you turn out fighting equipment for Uncle Sam or are re-tooling for peace-time production, you'll find Chicago Wheels just what you've been looking for to produce better, smoother finishes.
The widest range of types, abrasives and bonds — wheels to do any job of grinding so accurately the finish can be measured in micro inches — rubber wheels for polishing or precision cut-off work.
You get the results of half a century of invention, tests and improvements from our modern research laboratory. And, this same laboratory is open to you — tell us about any grinding problem you have and our engineers will tell you how best to whip it.
GRINDING WHEELS up to 3" in diameter in various bonds, including the new FV, the bond with a pedigree.
MOUNTED WHEELS in every practical shape, grain and grade, each firmly mounted on a steel shank.
TRY A TEST WHEEL — Write us what material you have to finish and size wheel you'd like. We'll send one promptly.
Write for Catalog of complete Chicago Line
CHICAGO WHEEL & MFG. CO.
1101 West Monroe Street Dept. MR. Chicago 7, Illinois
*Half a century of specialization has established our reputation as the small wheel people of the abrasive industry.
CHICAGO
GRINDING WHEELS AND MOUNTED WHEELS
ARMY NAVY
MR-5
Send Catalog. Interested in ☐ Mounted Wheels
☐ Grinding Wheels. ☐ Send Test Wheel. Size........
Name..
Address..

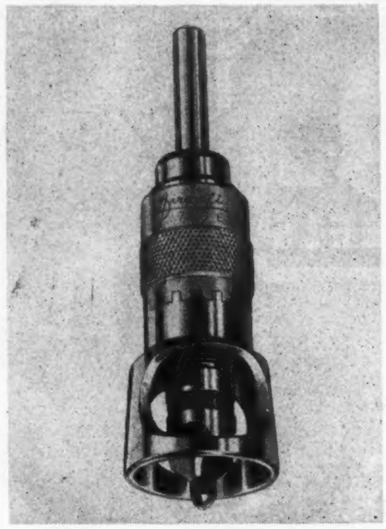
able for countersinking coarser work, such as brake linings. They are made of high-speed steel and are ground after hardening.

The set comes in a durable hinged box of polished wood with individual pockets for each size. The standard set is made for countersinking to an angle of 41 degrees, but it can also be furnished for countersinking to angles of 45 and 30 degrees. 63

Micro-Set Stop Countersink

A new micro-set stop countersink with a large bell skirt has just been added to the line of cutting tools made by Aircraft Tools, Inc., 750 E. Gage Ave., Los Angeles 1, Calif. The bell skirt of this countersink is designed to give added base support, to insure better tool alignment, and to provide greater chip clearance. This countersink, designated Model AT-400-B, has positive micrometer adjustment, is compact, light in weight, and is made from high-speed tool steel.

The shaft runs in an Oilite radial bearing, the thrust being taken by a ball bearing. The concentricity of shaft, pilot, and cutter is held to close tolerances. The cutters are accurately ground to correct cutting angles, and the flutes are polished to facilitate the elimination of chips at high speeds and to give chatterless performance. Spring retraction of the shaft provides for cutter protection. This countersink takes up to 5/8-inch cutters. All parts are interchangeable and replaceable, and interchangeable cutters and pilots are available from stock...64



Countersink with Micrometer Depth Stop

Newton Air-Operated Bar-Stock Feed

A new air-operated bar-stock feed for lathes has just been announced to the trade by the Newton Mfg. Co., 215 W. 7th St., Los Angeles 14, Calif. This stock-feeding unit is made in seven sizes to handle bar stock in lengths from 6 to 11 feet. It is furnished as a complete unit ready for use, including stands, seamless tube, pressure regulator, and feed piston.

The air line is connected to the pressure regulator, which delivers air under the desired pressure to the far end of the stock tube. The piston, acted on by the air, pushes the stock into the lathe and against the stock stop under uniform pressure. Work rejections due to variations in length caused by differences in feeding pressure are thus eliminated. The pressure regulator can be quickly adjusted for feeding stock of different weights. Only a small amount of line pressure is necessary for feeding the stock; for example, a pressure of 4 pounds will feed an 8-foot length of 1/4-inch round stock.

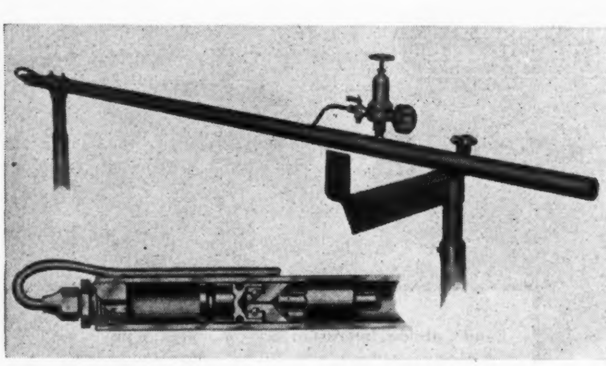
Noiseless feeding of the stock is accomplished by the piston, the forward end of which is of inverted cone shape, mounted on end-thrust ball bearings. The cone-shaped end of the piston centers the stock and turns with it, thereby preventing it from making contact with the feeder-tube. The piston has carbon-impregnated Neoprene rubber rings, which seldom require renewal.

Stock loading is easily accomplished with this feed. It is only necessary for the operator to release the tube lock by a turn of the hand-knob, swing the tube over on the slide bracket, insert the bar stock, return the tube to its feeding position, and lock it. 65

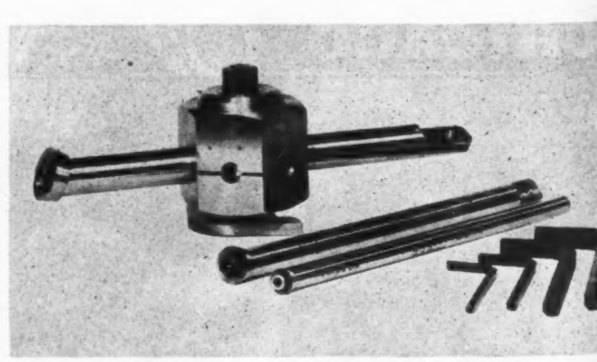
"Shearcut" Boring Tool and Holder

The Shearcut Tool Co., Tenth and Harris, South Bellingham, Wash., has developed a new type of boring and cutting tool holder for use with the "Shearcutter" boring and turning tools previously brought out by this company. The new precision tool-holder is made in five sizes for use in lathes and screw machines having swings of 10 to 36 inches.

Each tool-holder is furnished with three boring-bars, one of which is arranged for turning in the smaller sizes. In the larger sizes, two bars are arranged for turning, as well as boring. The tool-holder is precision made, and is furnished with circular cutters



Air-operated Bar-stock Feeding Equipment Made by the Newton Mfg. Co.

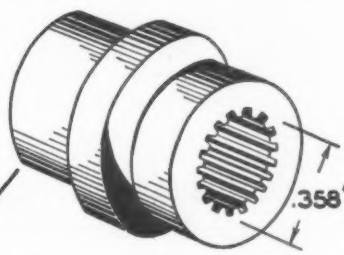


Circular Boring Tools and Holder Developed by Shearcut Tool Co.

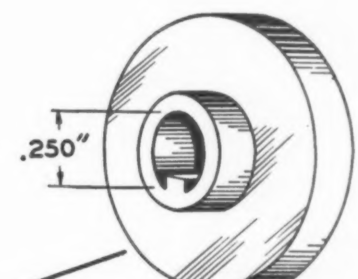
To obtain additional information on equipment described on this page, see lower part of page 182.

They're Everyday Jobs for the "Junior"

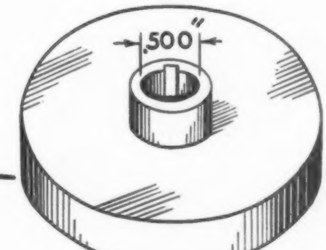
PULL BROACHING
(With Pull-Down Attachment)



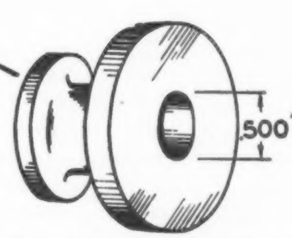
Broaching small splines in lever hubs.



Broaching inverted .062 key in ¼" hole, ½" long.

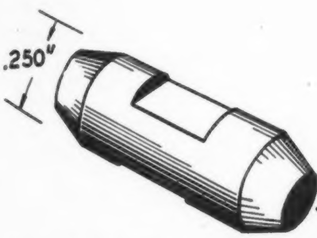


Cutting .155 by .070 keyway ¼" long in ½" hole.

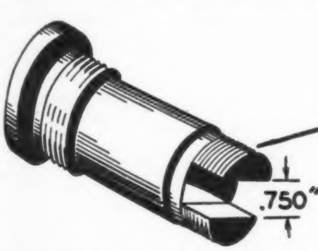


Removing .004 to finish a ½" hole, ¾" long.

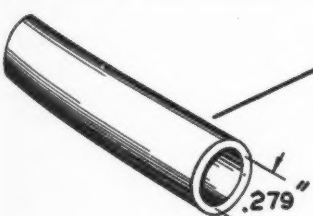
PUSH BROACHING



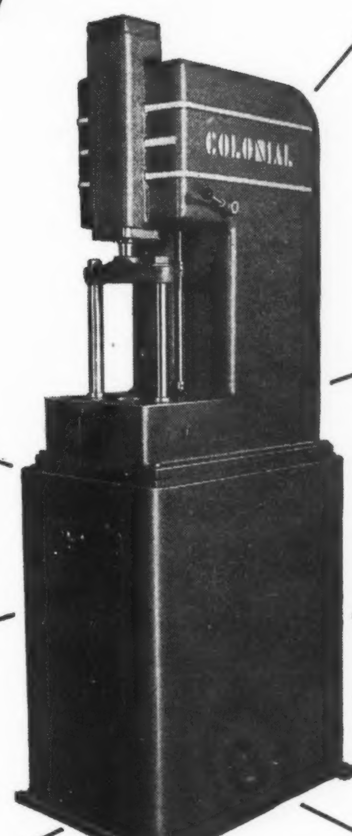
Straddle Broaching ¼" wide flats on ¼" diam. pivot pins.



Burring slots in fuse bodies after turning and threading.



Finishing ID to .002 in 1-½" long seamless brass tubing.



In practically every shop there are "little" jobs—assembly, broaching, etc.,—which the Colonial "Junior" Press—with or without pull-down attachment, base type or bench type—can do quicker and better. Full hydraulic—available with variable speed and pressure controls. Capacities 1 to 4 tons; 12 inch stroke.

Ask for Bulletin #VJ1-44

colonial BROACH COMPANY
DETROIT 13, U.S.A.

Broaches — Broaching Machines - Broaching Equipment

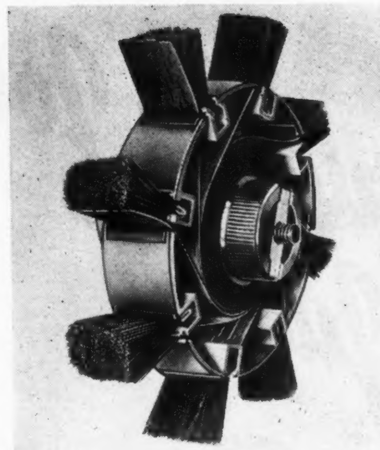
that produce an exceptionally fine finish. From twenty to fifty new cutting edges are made available on each circular cutter by simply rotating it to a new position in its holder. After the entire circular edge has become dull, the cutter can be readily resharpened. 66

"Sand-O-Flex" Brush-Backed Sanding Wheel

A new brush-backed sanding wheel known as the "Sand-O-Flex" has just been placed on the market by the Exactone Tool & Die Co., 4373 Melrose Ave., Hollywood 27, Calif. This wheel is designed to sand, de-burr, and finish woods, metals, plastics, rubber products, and many other types of materials. The outstanding feature of this sanding wheel is its adaptability to jobs that were formerly done only by hand. The wheel consists of a central magazine which houses the strip abrasive, as shown in the accompanying illustration. Eight of these strips extend through the housing and are held against the work by tough bristles. The bristles cushion the abrasive, making it possible to sand in and around corners, hollow and fluted surfaces, and in small openings.

The over-all diameter of this wheel, including the brushes, is approximately 8 inches, and the weight, when fully loaded with abrasive strips, is 2 3/4 pounds. Normal loading consists of 20 feet of abrasive. Reloading is accomplished by simply unscrewing the serrated nut, removing the cover, and placing the abrasive strips in position. A wide range of abrasives of various grits and grades is supplied for use with the sander. These strips in cartridge form, plus the quick-changing feature, permit the same tool to be used in all operations from the rough surfacing stage to the final polished surface.

The Sand-O-Flex wheel is designed to fit all standard 1/2- and 5/8-inch motor shafts of stationary or flexible-shaft polishing machines, or it can be supplied to order for almost any shaft size. A 1/4-H.P. electric motor



"Sand-O-Flex" Sanding Wheel with Cover Removed to Show Method of Reloading Wheel with Abrasive Strips

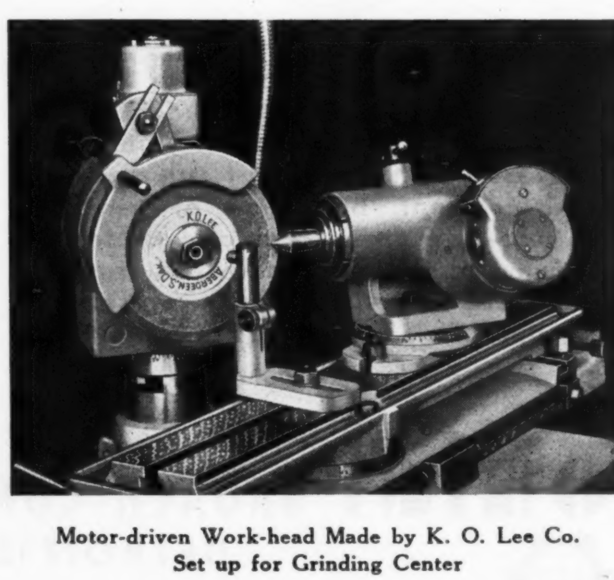
will handle all normal sanding operations. A motor speed of 1750 R.P.M. is recommended, decreasing the speed in proportion to the coarseness of the abrasive used in accordance with the results desired. No special skill is needed to use the wheel, nor is much pressure necessary to obtain a good finish...67

Motor-Driven Work-Head

The K. O. Lee Co., Aberdeen, S. D., is now building a compact, newly designed motor-driven work-head with a self-contained power unit. This work-head is built for use on any make of grinder, large or small. It is constructed with a No. 11 B & S tapered spindle, which is mounted on ball bearings, hardened and ground, and is designed to receive chucks, collet fixtures, faceplates, centers, etc.

The built-in universal motor is provided with a conveniently located reversing switch, which can be easily operated, regardless of the position of the work-table or work. The motor is fully protected from dust and from entrance of oil into the working parts. The unit is quickly and easily mounted at any convenient spot on the table, and is held in position by two T-slot bolts.

The fixture itself is mounted on a detachable swivel base, which is graduated 45 degrees each side of center and permits a full 360-degree swiveling movement. The swing over the table, when using the swivel base, is 8 1/4 inches, and without the swivel, 6 1/4 inches. The unit measures 7 inches wide, 6 1/2 inches long, and 7 3/4 inches high, and weighs 20 1/2 pounds. 68



Motor-driven Work-head Made by K. O. Lee Co. Set up for Grinding Center

Lincoln All-Position Welding Electrode

A new shielded-arc electrode for general-purpose welding of mild steel is being placed on the market by the Lincoln Electric Co., Cleveland 1, Ohio. The advantages claimed for this new electrode, designated "Fleetweld 47," include extremely low loss from spatter; easy slag removal, as it is practically self-cleaning; and excellent restriking characteristics.

It conforms to American Welding Society electrode specifications Class E-6012 and E-6013; can be used with either alternating or direct current; is especially suited for making high-speed horizontal or flat fillet welds over 4 inches long in which the coating can be "dragged" on both plates; and has been used extensively for both vertical and overhead fillets, especially where large single-pass fillets are desired.

The new electrodes are available in 5/32- and 3/16-inch sizes in 14-inch lengths, and in 1/4- and 5/16-inch sizes in 18-inch lengths. 69

To obtain additional information on equipment described on this page, see lower part of page 182.

10 types of prints instead of 1

when you use OZALID

1. Black-Line
2. Blue-Line
3. Red-Line
4. Dryphoto
5. Sepia-Intermediate
6. Transblack Intermediate
7. Transparent Cloth
8. Transparent Foil
9. Opaque Cloth
10. Chartfilm

Ten Types of Prints . . . and no end to the uses you'll find for them in the drafting room . . . and in departments where you never thought of using prints before.

OZALID offers this versatility because it is a uniquely different process requiring only two steps—Exposure and Dry Development—to reproduce your engineering drawings or other originals.

These two steps are performed in as little as 17 seconds by an OZALID WHITE-PRINT MACHINE . . . and if you have a satisfactory printer you need only add an OZALID DRY DEVELOPER to make *all* ten types of prints.

It's inexpensive to adopt OZALID . . . and you count improvements right away in economy, speed and versatility.

10 instead of 1 means increased versatility for all departments

In the Drafting Room, OZALID prints are always easier to read, check and make notations on. And when changes in design are necessary, OZALID intermediates (transparent prints) of original drawings save valuable time. A) Obsolete lines are quickly removed with OZALID CORRECTOR FLUID. B) NEW DESIGN is drawn in. C) OZALID INTERMEDIATE is used to produce desired number of "work prints."

In the Shop, efficiency is increased by assigning identifying colors to prints of different operations—distinguishing checked from unchecked prints, etc. OZALID OPAQUE CLOTH is used when exceptionally durable prints are desired, and OZALID CHARTFILM, which can be readily cleaned and requires no protective covering, is used for instrument panels, wiring diagrams, etc. Also, OZALID DRY PHOTOS of any photographic subject may be employed.

In the Office, anything drawn, typed, printed or photographed on translucent material can be reproduced in seconds with OZALID.

For example: The Prudential Life Insurance Company of America uses OZALID to reproduce applications for Industrial Insurance; Pratt Institute—to copy student records; Alpha Music—to reproduce arrangements for CBS and other radio programs.

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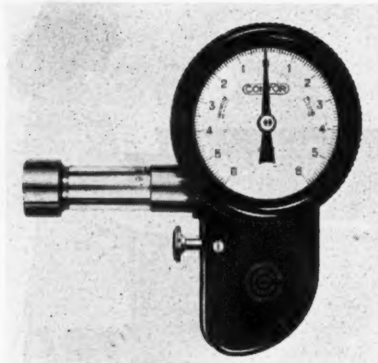
OZALID IN CANADA—HUGHES-OWENS CO., LTD., MONTREAL



Comtorplug Gage Equipped with Shock-absorbing Movement

Amplifier Gage with Shock-Absorbing Movement

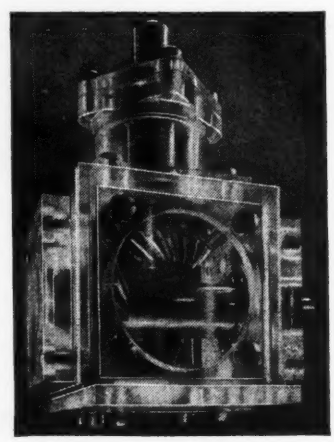
The Comtor Co., 74 Rumford Ave., Waltham, Mass., has just brought out a new Model P-2 Comtorplug amplifier gage which has a shock-absorbing movement designed to withstand rough handling. Although it was originally designed as a precision inspection check gage, the Comtorplug, has been used extensively at machines in the shop and for routine bench inspection, where it often receives rough handling, especially when used by trainees. The new shock-absorbing movement can be applied to the P-1 models already in use. It fully protects the gage from any possible shock when in use due to a suddenly applied force. 70

Spiral Bevel Gear Assemblies for Remote Mechanical Control

A standardized system of remotely operated mechanical controls has been brought out by M. L. Bayard & Co., 1914 Indiana Ave., Philadelphia 32, Pa. This control system is adapted for use on such equipment as cranes, winches, windlasses, and steering gears; for opening and closing large valves and ventilators by means of motors; and for the operation of banks of furnace doors, factory windows, etc. The related units are suitable for power operation at speeds not exceeding 1800 R.P.M. Terminal connections are constructed so that rearrangement of the units can be made without disturbing the assemblies or affecting the internal adjustment.

The "Steady Shaft Assembly" unit shown in the illustration is available in two standard types. One is designed for attachment to a surface at right angles to the shaft, and is particularly suited for deck, bulkhead, or other water type mounting. The other is intended for attachment to a surface that is parallel to the shaft. With the spiral bevel gear assembly illustrated, all shaft ends are interchangeable. Either two or three of the shaft ends can be connected to other control units as required.

The universal shaft assembly is made in lengths ready for installa-



Phantom View of Right-angle Drive Unit of Remote Control Equipment

tion or with one end yoke arranged for installation by field welding after the tube is cut to the correct length. Telescoping splines between the end yokes permit installation and removal of the shaft assemblies without disturbing the other control units. 71

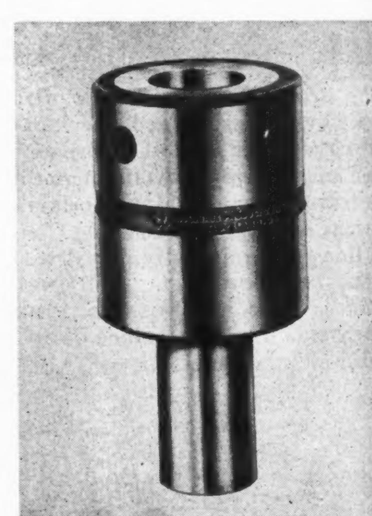
"Kleervu" Transparent Safety Guards for Machine Tools

A line of safety guards, designed to combine the utmost in operator protection with the important feature of an unobstructed view of the work, has been brought out by the Wright-Austin Co., 343 W. Woodbridge St., Detroit 26, Mich. These new guards, known as "Kleervu," are transparent and allow a full view of the work without interfering in any way with the operation of the machine. Sparks, metallic particles, splashing liquids, etc., are confined by the guards and are not permitted to come in contact with the operator. The invisible, chip-proof "Kleervu" shields are made from a heavy-gage plastic which is as clear as window glass but has great toughness and high resiliency. The guards are available in a number of standard sizes, but can be supplied in sizes and shapes to fit any machine. 72

Z&W Releasing Type Tap-Holders

A new releasing type tap-holder designed to permit production tapping to aircraft manufacturing limits on both automatics and turret lathes has been developed by Z&W Machine Products, Inc., Cleveland, Ohio, and is being placed on the market by the Champion Sales Co., 2832 E. Grand Blvd., Detroit 14, Mich. It is claimed that tap life has been increased in many cases from ten to twenty times by the use of this holder.

Outstanding features of the holder include extreme rigidity, positive drive, and precision construction. The first thread cut by a tap used in this holder is always a full thread instead of being tapered or sharp. The release point can be accurately set, and the tap rotates freely when released, giving positive depth control. Blind holes are successfully bottom-tapped with a minimum risk of tap breakage, and the tap can be withdrawn without damage to the threads. The multiple-jaw clutch



Z & W Releasing Type Tap-holder

To obtain additional information on equipment described on this page, see lower part of page 182.

design gives a positive drive, instant release, and serves to minimize wear.

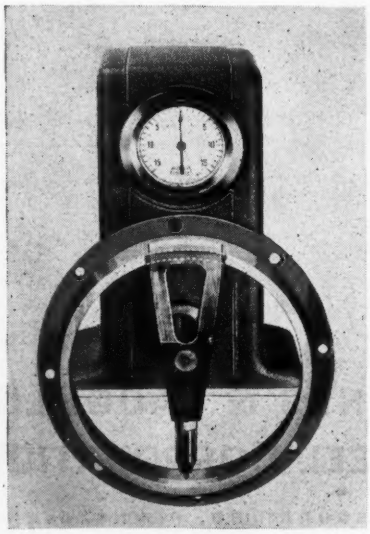
This holder, while especially designed for automatic screw machines and turret lathes, can also be used to advantage on practically any type of tapping machine. The holder is made for both right- and left-hand tapping and in sizes for holding taps from 1/4 inch to 1 1/2 inches. 73

"Go" and "No Go" Plug Gage with Reversible Plugs Gripped by Red and Green Collets for Quick Identification

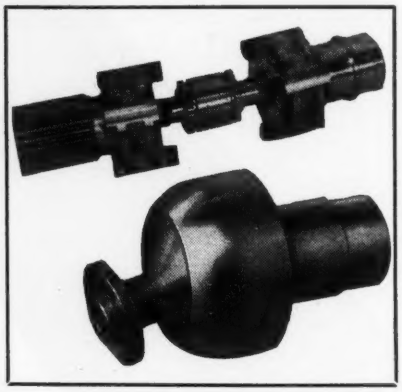
Air-Operated "Hole Checker" for Large-Diameter Work

The American Gauge Co., 164 Bayard St., Dayton 1, Ohio, has recently equipped its "Hole Checker" with an unusual type of gage for the rapid checking of large inside diameters. With this equipment, the hole in the large bearing housing shown in the accompanying illustration can be quickly gaged to very close tolerances. The upper part of the special sizing plug developed for this spring operation is finished to the exact radius of the inside of the bearing housing. The lower part carries the gaging head, which is calibrated for high and low limits of accuracy. The contact point is made of highly polished Norbide to resist wear.

The manufacturer claims that by using this type of sizing plug, work of large diameter can be checked easily for size, taper, and out-of-round condition. The "Hole Checker" unit is air-operated, and is set with high and low limit master ring gages for a tolerance of 0.0005 inch. 74



Air-operated "Hole Checker" Equipped for Rapid Checking of Large-diameter Holes



Constant-velocity High-speed Universal Joints Made by the Gear Grinding Machine Co.

High-Speed Constant-Velocity Universal Joints

Two constant-velocity universal joints of the designs shown in the accompanying illustration have been brought out by the Gear Grinding Machine Co., 3901 Christopher, Detroit 11, Mich. These universal joints operate at speeds up to 9000 R.P.M. between shafts subject to a maximum deviation of 6 degrees from the normal position. It is claimed that these joints deliver to the driven member the same constant speed of rotation provided by the driving member at all speeds and at all angles of deflection.....75

Colored Plastic Collets Identify Plug-Gage Ends

Tough, light, and durable colored plastics are used by the United Precision Products Co., 3524 W. Belmont Ave., Chicago 18, Ill., in producing the collets of "Dublife" precision plug gages. The metal collets formerly used have been replaced by the colored plastic collets—green being employed for the "Go" plug and red for the "No Go" plug. As both of these plugs are contained in the same handle of "Dublife" reversible plug gages, it is a great advantage for the user to be able to identify at a glance the "Go" and the "No Go" ends of the gage.

The plastic collet serves to grip the plug with a much more secure hold than the metal collets, and prevents the plug from being twisted out of the holder. The plug can, however, be easily removed by using a drift pin. The use of plastic collets reduces the weight of the gage and improves its balance. The collet construction of these gages permits reversing each plug, so that in effect there are two "Go" plugs and two "No Go" plugs assembled in each "Dublife" handle. When one end of a plug becomes worn, it is a simple matter to reverse its position in the holder..76

Protective Face Shields

Four new face shields to provide light-duty protection in performing operations such as metal sawing, acid handling, buffing, sanding, and light grinding have just been brought out by the American Op-

Four Types of Face Shields for Protection under Different Working Conditions

To obtain additional information on equipment described on this page, see lower part of page 182.


GEARS FOR AIR POWER
12 MORE PER TOOL GRIND

tical Co., Southbridge, Mass. While the new face shields are light in weight, they are sturdily constructed to withstand hard use, and can be worn without discomfort by workers who wear prescription glasses.

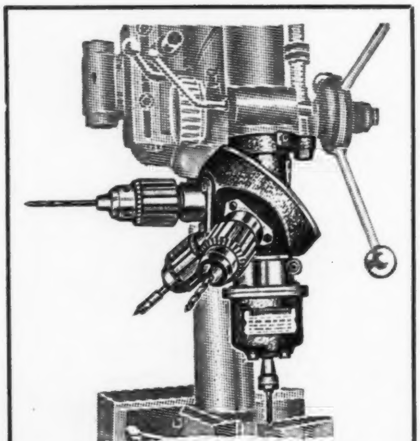
The company has also announced three types of "button-on" windows for these shields—one made of clear cellulose acetate for general purposes; one made from 24-mesh screen for heat protection; and one from fiber with a filter glass window for welding and scarfing.___77

Kennametal Universal Tool Blanks

Kennametal Inc., Latrobe, Pa., has brought out a line of "Universal" tool blanks, Style S-000, of rectangular shape with a 12-degree clearance angle formed on one of the long edges. These blanks can be used to make different types of tools by setting them into open-end recesses in shanks or holders. They are available in all regular standard sizes, having thicknesses of 3/16 inch or more. Many of the sizes are stocked in steel-cutting grades. ____ 78

"Quad-Tapper" Tapping Head

A new tapping unit designed for use with the "Quadrill" turret attachment for drill presses has recently been placed on the market by the Chicago Drillet Corporation, 919 N. Michigan Ave., Chicago 11, Ill. This precision-built, high-speed, self-reversing tapping attachment, known as the "Quad-Tapper," can be used with taps in sizes up to 1/4 inch. It is interchangeable with any of the four spindle assemblies of the "Quadrill," and can be mounted in any one of the four positions.



"Quadrill" Turret Attachment Equipped with Tapping Head

Strain and wear on this tapping head are claimed to be minimized and torsion eliminated by the three-point balanced heat-treated gear reversing mechanism designed to distribute the pull through three intermediate gears. The reverse speed is twice the forward speed. The tap idles while being fed in the tapping direction, but revolves while being backed out of the work. ____ 79

* * *

Bench Type Spot-Welders

The "Midget" automatic spot-welders described and illustrated in April MACHINERY, page 244, are manufactured by the Universal Power Corporation, 4900 Euclid Ave., Cleveland 3, Ohio, and are distributed by the Interstate Machinery Co., Inc., 1451 W. Pershing Road, Chicago 9, Ill.

* * *

Magazine-Feed Tool for Driving Nuts

A new development in nut-driving equipment has been made available to industry by the E-Z-On Co., 9551 Grand River Ave., Detroit 4, Mich. A magazine inserted in the handle holds the nuts to be driven and delivers one nut at a time directly on the stud over which the nut-driver is held in position. Either an air or an electric nut-driving unit can be used as the driving medium. The nuts driven can be of any size and of any particular style—square, hexagonal, slotted, Elastic Stop, castle, acorn, or cap.

* * *

Propulsion machinery aggregating more than 7,000,000 horsepower was installed in ocean-going merchant ships in the United States in 1944. This is almost twice the total power of the entire merchant fleet of the United States previous to 1941.

Recognition for War Workers

The Lawrance Aeronautical Corporation, Linden, N. J., is awarding to each employe who has worked with the corporation on war production a "certificate of service in war work" suitable for framing. The employe's name is filled in on this certificate, and the time that he has been engaged in the performance of essential war work is indicated. The certificate gives the worker and his family a tangible evidence that he can retain and that in future years will show his part in the war effort.

* * *

Aluminum Ladders

A complete line of industrial ladders made from aluminum tubular and channel rail construction have been placed on the market by the Duo-Safety Ladder Corporation, 809 Ninth St., Oshkosh, Wis. The all-aluminum construction offers the advantage of light weight, combined with great strength. These industrial ladders are made in both single and extension models and in several types.

* * *

Management Course at University of Iowa

The College of Engineering, State University of Iowa, Iowa City, Iowa, has announced its 1945 management course, devoted to production planning, plant lay-out, motion and time study, wage incentives, and related subjects. The course will be of three weeks' duration—from June 11 to 29, inclusive. Those interested should communicate with Professor Ralph M. Barnes, director of the Summer Management Course at the university.

* * *

The knowledge of magnesium gained as a result of its use in wartime products will serve as a stimulant for the post-war designer. Although, compared with other structural metals, the use of magnesium is still in its infancy, magnesium has already made for itself an important place in the world of metals.

To obtain additional information on equipment described on this page, see lower part of page 182.

STOP RUST

BEFORE RUST STOPS YOU!

$1,000,000,000 per year—*one thousand million* dollars . . . that's RUST'S annual "loot" from industry!

Your share? Actually, it's a lot more than you think—whatever your type of production. For Rust's "loot" is measured in depreciated machinery . . . in wasted time and materials . . . plus losses you can't even begin to calculate.

There's only one way "out." That's . . . *Stop Rust before it starts!* Stop it before it stops you.

Use Shell Tellus Rust-Preventive Oils to lubricate machines, wherever moisture is a factor. These Shell developed and perfected oils possess special rust-inhibiting qualities and, therefore, provide protection against the *formation* of rust.

Furthermore, *these oils have been developed without sacrifice in other important characteristics.*

Use the new Shell Ensis Rust-Preventives as protective coatings. They come in a complete line of oils, fluids, and compounds. The protective coatings formed range from thin, transparent oil films for use between machining operations to heavy, abrasion-resistant surfaces that stand up against weather and time.

Call the Shell man now. Let him study your operations and show you how to "stop rust!"

Write, wire or phone: Shell Oil Company, Inc., 50 West 50th Street, New York 20, N. Y., or 100 Bush Street, San Francisco 6, Calif.

SHELL

SHELL RUST PREVENTIVES ...OILS...FLUIDS...COMPOUNDS

Air-Conditioning Improves Output in a Ball-Bearing Plant

With a view to protecting high-precision accuracy in ball-bearing manufacture, SKF Industries, Inc., Philadelphia, Pa., have provided air-conditioning in three of the company's plants, including a new windowless blackout plant. Air-conditioning equipment, with a total capacity of 2000 tons of refrigeration, has been installed by the York Corporation, York, Pa., whereby a total of 550,000 cubic feet of cool, filtered air a minute is circulated through the plants by means of a chilled water system and electrostatic air cleaners.

The air-conditioning system has been installed to perform four essential jobs, all aimed at improved production and a reduction of spoiled parts: (1) To prevent stain-producing humidity from attacking highly finished bearing parts while stored or while being handled in assembly and final inspection; (2) to help to maintain accurate dimensional control by preventing variations in temperature; (3) to keep factory atmosphere free from lint and dust, dirt, vapor, and grinding grit, thus preventing contamination of the oiled surfaces, bearing races, balls, and rollers by these substances; (4) to prevent fatigue and lowered efficiency of the workers in summer through excessive temperature.

In the new windowless blackout plant of the company near Philadelphia, the entire manufacturing, assembly, and inspection areas are kept at a constant temperature of approximately 80 degrees and at a humidity of 45 per cent. All three of the air-conditioned plants have 2 inches of roof insulation and steam coils to maintain the required controlled temperature in the winter. Electrostatic air cleaners in the assembly and inspection departments filter out nearly 100 per cent of all smoke and dust particles.

Before controlled indoor temperature and humidity was installed, summer temperatures rose as high as 94 degrees, making painstaking inspection and assembly work very difficult. By dropping these peak temperatures, on an average, from 15 to 20 degrees and maintaining a constant low humidity, the general plant efficiency has been increased in all departments. In addition, corrosion of highly finished surfaces from perspiration has been largely eliminated.

Color Standard for Machinery Lubrication

A standard to facilitate the lubrication of machinery and to reduce the damage to machine parts caused by wrong lubricants being applied by unskilled labor has been developed through the American Standards Association at the request of the National Machine Tool Builders' Association and the War Production Board. The standard, known as "Color Code for Lubrication of Machinery," aims to make the application of the right lubricant so simple that inexperienced employes cannot make a mistake.

A basic system of color markings has been worked out to be applied to the containers of lubricants and also to the points where each lubricant should be applied. The lubricating device—be it an oil-can or a grease-gun—and the lubrication fitting to be serviced with the lubricant are marked with the same color; thus, the service man has only to "match colors" to be sure that each lubricant is being used in the right place. The use of the color code is independent of the question, "What kind of lubricant should be used for a particular piece of machinery?" That question is decided by the user of the machinery, possibly on the basis of advice from its manufacturer.

The new code covers eight general classes of lubricants, each designated by an identifying color. The oils are divided into five classes and the greases into three. For both oils and greases there is a general-purpose class and a special-purpose class. The three remaining classes of oils are machine tool spindle oils, gear oils, and hydraulic oils; the remaining class of grease is for anti-friction bearings.

Copies of the American War Standard Color Code for Lubrication of Machinery, identified as Z47.1–1945, can be obtained from the American Standards Association, 70 E. 45th St., New York 17, N. Y., at 20 cents each.

Training Program to Aid Shell Producers

Because of the tremendous increase in shell production, calling for a corresponding increase in the utilization of carbide tools, the Carboloy Company, Inc., Detroit, Mich., has developed a training program specifically designed to enable shell manufacturers to obtain better over-all performance and increased service life from carbide tools. The course is designed to serve two definite purposes: In new shell plants it will provide training in the use of carbide tools in general, and will also give specific instructions in the use of carbide tools for shell-machining operations. In shell plants where carbide tools have been in use for some time, the training course will serve to furnish new information on improved practices in machining developed as a result of experience in shell production.

The special training program comprises a series of slide films on "Carbides," "Grinding Carbide Tools," "Designing Tools," "Brazing," "Chip-Breakers," and "Putting Tools to Work." It also includes a newly developed set of sixty training charts designed for group instruction. These charts provide a condensed training course in the essential points of good practice in machining shells with carbide tools. The charts cover design, brazing, grinding, inspection, and application of carbide tools. Instruction leaflets for distribution to operators contain reproductions of these charts. The films are available at cost, and the charts and leaflets can be obtained by shell plants without charge.

* * *

Automotive Engineers to Hold Local Meetings

The local sections of the Society of Automotive Engineers have embarked on a program of local war emergency meetings to disseminate essential war-engineering information. The new series of meetings has been arranged because of the cancellation of national meetings until the end of the present emergency. As soon as the war ban on national meetings is lifted, the Society will resume its national meetings program.

PROPAGATING LIFE-SAVING PENICILLIN

● In the propagation of Penicillin, the miracle, life-saving drug, it has been found that the Rotating Tanks used in the process must be driven at speeds which are *infinitely and accurately* variable.

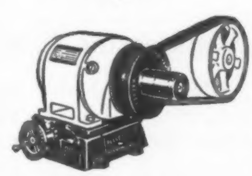
To insure the exact speed required for each changing condition in the process, The Graver Tank & Manufacturing Co. equips its Propagating Tanks with REEVES Vari-Speed Motor Pulleys. Rotating speeds can be adjusted instantly and to fractional r.p.m., while the tank is in motion, merely by turning the REEVES handwheel.

Here, again, the smooth, accurate, stepless speed adjustability of REEVES Speed Control makes an important contribution to precision processing. REEVES Speed Control is the answer to accurate production control in a large number of manufacturing operations—drying, separating, feeding, cutting, drilling, stamping, conveying, mixing, heating, cooling, winding, etc. It is standardly provided on 1,866 different makes of driven machines. Look for the familiar REEVES handwheel on any new machine you buy. It is your assurance of greater versatility, uniform quality and larger output of production. Easily installed, too, on machines in service. For complete information, send for Catalog MG-450.

The 3 Basic Reeves Units

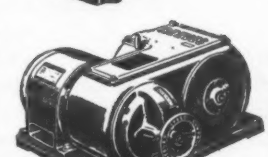
VARIABLE SPEED TRANSMISSION

Provides infinite, accurate speed flexibility over wide range—2:1 to 16:1 inclusive. Sizes fractional to 87 h.p.



VARI-SPEED MOTOR PULLEY

Converts any standard constant speed motor to a variable speed drive. Ratios of speed variation within 4:1. Sizes to 15 h.p.



MOTODRIVE

Combines motor, speed varying mechanism and reduction gears in single unit. Ratios of speed variation 2:1 to 6:1 inclusive. Sizes to 15 h.p.

REEVES PULLEY COMPANY • COLUMBUS, INDIANA

Recognized Leader in the Specialized Field of Speed Control Engineering

REEVES *Accurate Variable* **SPEED CONTROL**

A Service for Firms that are Looking for Sub-Contracts

One of the difficulties with which firms taking sub-contracts are familiar is that of finding a prime contractor who has work to sublet that is suitable for the sub-contractor's equipment. To aid the sub-contractor in overcoming this difficulty, a service is now being provided by the Stanley Plan Corporation, 60 E. 42nd St., New York 17, N. Y., the purpose of which is to aid the sub-contractor in finding suitable work for his shop.

Through the information made available to him by this service, he can readily locate the prime contractors that have work to be done, and can pick from the available lists the kind of work for which his shop equipment is adapted. If he is an efficient producer, he can increase the volume of his business to any degree possible with available equipment and man-power. Obviously, the prime contractor is as anxious to find suitable sub-contractors as the latter are to obtain contracts, so that the service is of equal value to the firm that needs bids from sub-contractors.

The information concerning sub-contract opportunities is made available to subscribers to the Stanley Service in a publication known as "Contract Opportunities." This publication gives the names of the various prime contractors that have sub-contracts to let and the names of the purchasing agent or sub-contracting manager; the type of work to be sublet and accuracy requirements; and the type of machines that must be available in the sub-contractor's shop to handle the work.

When, upon studying this information, the sub-contractor finds that he has the necessary machinery and that he can work to the tolerances and other requirements specified, he can communicate directly with the prime contractor, dealing with him at first hand, and not with any agent or intermediary. In this way, business has been brought to a great many shops that previously had failed to find suitable sub-contract work, and permanent connections are established with important prime contractors.

When we return to peacetime production, such a connecting link between concerns having work to be done and suppliers able to do the work will be just as important as it has been during the war years. Then the sub-contractor will find it highly necessary to find work for his facilities, and the manufacturer with part-contracts to let will need satisfactory suppliers. When the cancellation of war contracts begins, it will be the part of wisdom for the sub-contract shop to be prepared for new connections.

Further information regarding the details of the service can be obtained from the Stanley Plan Corporation at the address given in the foregoing.

New Booklet on Exhaust Hood Design

EXHAUST HOODS. By J. M. Dalla Valle. 49 pages, 8 1/2 by 11 inches. Published by HEATING AND VENTILATING, 148 Lafayette St., New York 13, N. Y. Price, (paper bound), $1.

This booklet, which consists of a collection of articles published in HEATING AND VENTILATING during the last two years, contains probably the most complete exposition on exhaust hood design for the efficient removal of duct fumes, vapors, and gases that has yet been published. It contains data, formulas, and practical examples showing the exact procedure to follow in designing this highly important unit of an exhaust ventilating system. The material is divided into twelve chapters as follows: Theory of Flow of Gases into an Opening; Velocity Characteristics of Unobstructed Openings; Velocity Contours of Hoods with Special Boundary Conditions; Criteria for Determining Hood Effectiveness; Hoods for Dust Control —Total Enclosures and Screening; Hoods for Dust Control—Partial Enclosures, Miscellaneous; Hoods for Control of Fumes, Mists, Vapors, and Gases; Booth-Like Structures for Fumes, Vapors, and Gases; Grill Type Openings under Suction; Hood Entrance Losses; and Examples of Calculations Required in Designing Hoods.

Redistribution of Idle Machines

The Army, Navy, Maritime Commission, Defense Plant Corporation, and the War Production Board have entered into an arrangement for the redistribution of idle machine tools and production equipment, known as the "Machine Tool Trading Pit," which promises to be of considerable value. The aim of the plan is to facilitate the transfer of machine tools and other production equipment which is no longer needed in one plant to some other plant where it can be of service.

Field representatives report on all Government-owned machine tools which they find temporarily idle in plants handling war contracts. These idle tools are listed as available in the so-called "Machine Tool Trading Pit" to which the representatives of the various Government agencies not only report available tools, but "bid" for them on behalf of their respective war contractors. Any war contractor may avail himself of the trading pit, but must do so through his contracting officer, from whom he can obtain further information.

* * *

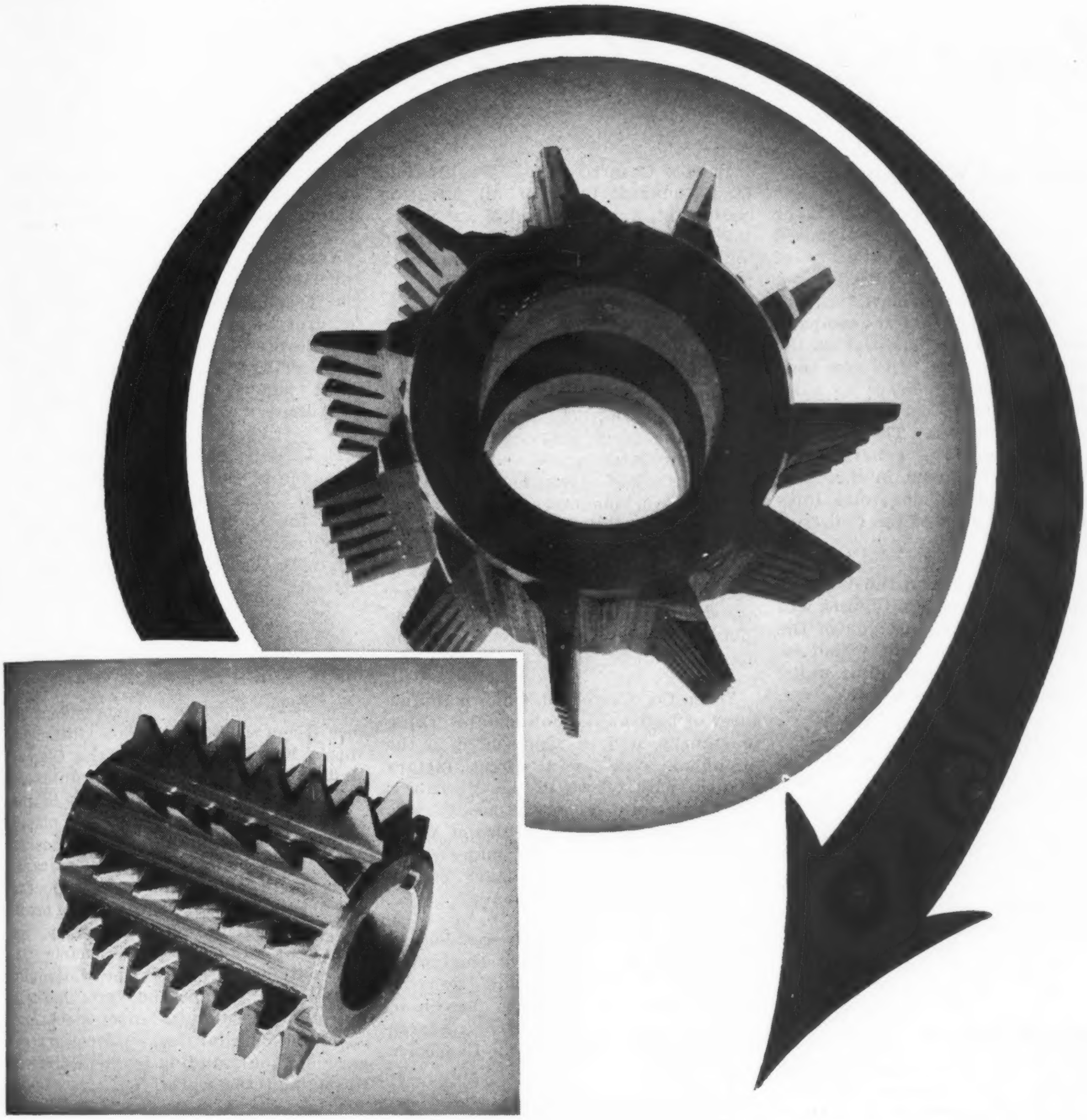
Hammers Made from Plastic Materials

Of late, plastic materials have been employed for hammers, which can be used effectively without marring the surface being hammered. A hammer of this type has been brought out by Industrial Products Suppliers, 2 Broadway, New York 4, N. Y. A tough, resilient plastic is used, and the head of the hammer is made heavy enough to strike an effective blow by providing it with a metal core.

* * *

Society for Testing Materials Cancels Meeting

The American Society for Testing Materials, 260 S. Broad St., Philadelphia 2, Pa., has announced that the annual meeting of the Society, scheduled to be held in Buffalo on June 18 to 22, has been cancelled in accordance with the request of the Government for the curtailment of convention travel.



HOW *NOT* TO SHARPEN A HOB

Grinding a hob far below the root diameter of the teeth—in sharpening—as has been done in this case, weakens the hob, with resultant increased chance of breaking out the weakened teeth. That the hob stood up even under these conditions—ground down as far as this one was in service before "retiring" it—is due to the excellent control of heat-treatment and quality of material at Michigan Tool Company. Good as "Michigan" hobs are, though, it is a lot to expect from gear cutting tools.

If you are cutting gears or splines you should have a copy of "Hobbing". Write for it by number (#149-A)

MICHIGAN TOOL COMPANY

7171 E. McNICHOLS ROAD . . DETROIT 12, U. S. A.

News of the Industry

California and Washington

HARRON, RICKARD & McCONE CO. OF SOUTHERN CALIFORNIA has purchased the entire property and buildings of its predecessor, HARRON, RICKARD & McCONE CO., at 3850 Santa Fe Ave., Los Angeles, Calif. The latter company withdrew from active business at the beginning of this year. The new company will continue to serve as sales representative for a large group of machine tool builders. The partners are ALEX B. TODD, JR., general manager; VICTOR J. WAGONER, in charge of the Machine Tool Division; and JOHN E. CARROLL, in charge of the Construction Division.

DAVE SMITH has joined the Western Gear Works, Lynwood, Calif., and will have charge of the engineering of the company's oil-field products, which include Pacific-Western pumping units, speed reducers, and band wheel drives.

WALTER DORWIN TEAGUE, of New York, industrial designer, announces the opening of offices in the Title Guarantee Bldg., Los Angeles, Calif.

SHEARCUT TOOL CO., Beverly Hills, Calif., manufacturer of "Shearcutter" boring and turning tools, has moved to South Bellingham, Wash., because of the labor shortage in southern California.

Illinois and Indiana

E. J. FLOOD has been appointed general district sales manager for the Chicago sales territories of the American Chain & Cable Co., Inc., Bridgeport, Conn. Mr. Flood has been with the company for twenty-five years in the Page Steel and Wire, and American Chain Divisions, and will continue his headquarters at 400 W. Madison St., Chicago, Ill.

GEROTOR MAY CORPORATION, Logansport, Ind., announces the appointment of COMPRESSED AIR PRODUCTS, Newark, N. J., as exclusive sales representative of Gerotor air and hydraulic devices in New Jersey and Greater New York.

Maryland and Dist. of Columbia

HARRY T. ROWLAND has been elected first vice-president of the Glenn L. Martin Co., Baltimore, Md. Mr. Rowland graduated from the United States Military Academy at West Point in 1923. He became actively connected with the Martin organization in 1936.

BRIGGS CLARIFIER CO., Washington, D. C., manufacturer of oil filtration equipment, has appointed MACK SALES, 425 E. Platt St., Tampa, Fla., distributor for the company in the state of Florida.

Michigan

MURCHEY MACHINE & TOOL CO., 951 Porter St., Detroit, Mich., who, for more than forty years, has manufactured threading tools and threading machines, has expanded operations into a Government-owned plant at another location in Detroit. The company has been awarded a contract for the manufacture of more than 100 shell-tapping machines. The new facilities are devoted exclusively to the manufacture of these and other threading machines.

YODER CO., Cleveland, Ohio, manufacturer of high-production metal-working machinery, will be represented in the Michigan area by a direct factory branch, with offices in the Maccabees Bldg., Detroit. E. C. MURDOCK, who has handled sales and service of Yoder products in that area for many years, has been appointed manager of the new office.

WILLIAM S. JAMES, past-president of the Society of Automotive Engineers, and well known for his research achievements in industry, has been made director of automotive research for the Ford Motor Co., Dearborn, Mich. The Automotive Research Division will function as a part of the Automotive Engineering Department.

Harry T. Rowland, Recently Elected First Vice-president of the Glenn L. Martin Co.

YORKE R. BALCOM, formerly plant superintendent of the Daniels Tool & Engineering Co., Detroit, Mich., manufacturer of special cutting tools, will now devote his entire time to sales and engineering. He will be succeeded as plant superintendent by JAMES P. McCARTHY.

E. D. WOLF has been appointed sales manager of the Michigan Broach Co., Detroit, Mich. He has been connected with the company for several years. Previous to his present association he was with the Ex-Cell-O Corporation, of Detroit.

New England

DR. ZAY JEFFRIES, vice-president of the General Electric Co., Pittsfield, Mass., has been awarded the Clamer Medal of the Franklin Institute for his "meritorious contributions to the science of metals, which he has placed on a new and more intelligible basis." Dr. Jeffries has acted in various capacities with the General Electric Co. since 1914. In 1932, he became president of the Carboloy Company, an affiliate of the General Electric Co. His contributions on the metallography of tungsten, on the theory of hardening and the constitution of steel, and on other metallurgical subjects are regarded as outstanding by metallurgists throughout the world.

ARTHUR R. SHEVLIN has been appointed sales agent for the TAFT-PEIRCE MFG. CO., Woonsocket, R. I., in the eastern New England territory. Mr. Shevlin will handle the Taft-Peirce line of gages, small tools, and magnetic chucks, and in addition, will handle the line of the ECLIPSE COUNTERBORE CO., Detroit, Mich., and the line of industrial diamonds produced by the DIAMOND TOOL & DIE CO., of Hartford, Conn. Mr. Shevlin's offices are located in the Park Square Building, Boston 16, Mass.

CLAYTON F. FISHER has been elected president and general manager of Sleeper & Hartley, Inc., Worcester, Mass. RAYMOND F. RUSSELL has been elected vice-president and treasurer. WILLIAM H. BLOUNT, formerly president, has retired because of ill health.

ROBERT PAXTON, works manager of the Philadelphia Works of the General Electric Co., will become manager of

the company's Pittsfield, Mass., Works, July 1, at which time L. E. UNDERWOOD will retire as manager there. Mr. Paxton entered the employ of the company in 1923 after graduation from Rensselaer Polytechnic Institute. He held various engineering positions, until, in 1940, he was made assistant to the manager of the Philadelphia Works, and later works manager of that plant.

FRANKLIN FARREL, JR., resigned as chairman of the board of directors of the Farrel-Birmingham Co., Inc., Ansonia, Conn., at the annual meeting of the board, and ALTON AUSTIN CHENEY was elected to succeed him. Mr. Farrel will continue as a director and as chairman of the finance committee. LESTER D. CHIRGWIN, general manager of the company's Buffalo plant, was elected vice-president in charge of manufacturing, and FRANKLIN FARREL 3rd, plant manager of the Ansonia-Derby plants, was elected secretary and assistant treasurer. The company also announces the appointment of ERIC C. GYLLENSVARD to the position of export sales manager, with office at 3700 Chrysler Bldg., New York City.

BULLARD Co., Bridgeport, Conn., manufacturer of machine tools, announces that at a recent annual meeting of the company all the officers and directors were re-elected. The officers re-elected were E. P. BULLARD, president; E. C. BULLARD, vice-president and general manager; E. P. BULLARD III, vice-president in charge of manufacturing; J. W. C. BULLARD, vice-president in charge of research; J. W. BRAY, vice-president in charge of sales; and A. E. NORTH, secretary-treasurer.

FAYETTE LEISTER has been advanced to the position of engineering manager of the Fafnir Bearing Co., New Britain, Conn. Mr. Leister joined the company in 1921 as a sales engineer, and was subsequently appointed assistant works manager. For ten years he has been manager of the Detroit territory.

WILLIAM T. O'CONNOR has been elected vice-president in charge of purchases of Manning, Maxwell & Moore, Inc., Bridgeport 2, Conn. Mr. O'Connor became connected with the company as purchasing agent in 1928.

New Jersey

PHILIP SCHAEFFER, vice-president of the American Swiss File & Tool Co., Elizabeth, N. J., manufacturer of files and other hand tools, has retired because of ill health. Mr. Schaeffer became connected with the company in 1925 as sales manager after having been manager of the Mills Supply Department of Fairbanks Co., New York City, for many years. BARNARD S. MEADE, previously executive sales manager, was elected vice-president to succeed Mr. Schaeffer at a recent meeting of the board of directors. Other officers elected were F. E. SHURTS, president; ARTHUR J. WUEHRMANN, treasurer; and THOMAS C. MAHON, secretary.

ELLIS L. SPRAY has been elected a vice-president of the Westinghouse Electric & Mfg. Co., Pittsburgh, Pa., in charge of elevator and air-conditioning activities of the company at Jersey City, N. J. The company also announces that the Westinghouse Electric Elevator Co. is being dissolved as a corporate entity, and that the activities formerly handled by that company will be continued as the Elevator and Air Conditioning Divisions of Westinghouse.

MARCEL C. BOSS has been appointed chief engineer in charge of design and production operations of the Optimus Equipment Co., Matawan, N. J., manufacturer of metal washing and drying equipment. Mr. Boss was formerly engineer with the Hanson-Van Winkle-Munning Co., of Matawan. Prior to that he headed an organization of his own in Paris, known as the Mabar Co., which manufactured metal washing and drying equipment.

L. EARLE WELCH has been elected vice-president of the Industrial Hard Chromium Corporation, 7 Rome St., Newark, N. J., and will head a newly established division of engineering research and development in the application of hard chromium plating to molds and tools used in the plastics industry. Mr. Welch was previously with the Bakelite Corporation.

LAWRENCE HALLERAN, until recently assistant supervisor of the Alloy Wire Mill of the Callite Tungsten Corporation, Union City, N. J., now becomes sales manager of the Wire Division, succeeding HAROLD M. MALM, who has become connected with Little Falls Alloys, Inc., of West Paterson, N. J.

Thomas P. Orchard, Recently Elected Third National Vice-president of A.S.T.E.

Lieutenant Commander David F. Robinson, New Partner in the Harrington-Wilson-Brown Co.

New York

LIEUTENANT COMMANDER DAVID F. ROBINSON, having been granted inactive status by the Navy Department, has become partner in the firm Harrington-Wilson-Brown Co., 405 Lexington Ave., New York 17, N. Y., dealer in metal-working machinery. Before Lieutenant Commander Robinson went into the service of the U. S. Navy, he was associated with William Sellers & Co., Inc., Philadelphia, Pa., for thirteen years in a sales capacity, handling the eastern territory.

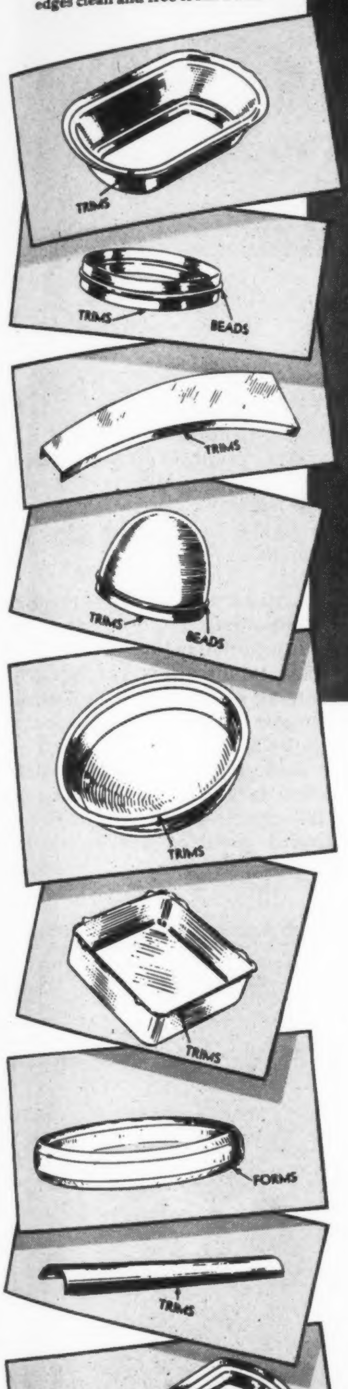
INTERNATIONAL NICKEL CO., INC., 67 Wall St., New York, N. Y., announces that several sections have been added to the Development and Research Division of the company, namely, the Industrial Chemicals Section, headed by O. B. J. Fraser; Corrosion Engineering Section with F. L. LAQUE in charge; and Iron and Non-Ferrous Casting Section, headed by DONALD J. REESE.

THOMAS P. ORCHARD, partner and general manager of the American Tool Engineering Co., 1775 Broadway, New York 19, N. Y., has been elected third national vice-president of the American Society of Tool Engineers. Mr. Orchard has taken an important part in the Society's activities since 1938. He was a charter member of the Northern New Jersey chapter and was later instrumental in forming the New York chapter. He was chairman of the latter chapter for two years, and is now serving as a national director representing both the New Jersey and New York City chapters on the board.

CHARLES C. CHEYNEY has been appointed sales manager of the Buffalo Forge Co., Buffalo, N. Y. For a num-

Do you know that one simple machine TRIMS • FORMS • BEADS • FLANGES Stampings of any size or shape

Shearing action of Quickwork stamping trimmer leaves all edges clean and free from burrs.



Here's a machine that cuts production time on all types of stampings

Quickwork stamping trimmers, specially adapted to each particular job, handle almost any type of stamping in a single plane—trimming, forming, beading, or flanging large or small stampings with or without flash, and cutting steel, aluminum alloy, and stainless steel with ease. With the Quickwork, these operations are reduced to seconds.

Quickwork stamping trimmers save valuable press time, eliminate the need for expensive trimming dies. Check their possibilities for removing your production bottlenecks; write for Bulletin QW-119.

QUICKWORK DIVISION

WHITING CORPORATION

15673 LATHROP AVENUE, HARVEY, ILLINOIS

ber of years he was Chicago representative of the company, and in recent years has been assistant sales manager.

LANDIS TOOL CO., Waynesboro, Pa., has opened offices in the Singer Bldg., 149 Broadway, New York 6, N. Y., with WALTER P. LOTZ, newly appointed eastern sales manager, in charge.

GEORGE RAHMANN & CO., 31 Spruce St., New York City, manufacturers of belting and leather products, are this year completing fifty years of activity in the machinery belting industry.

Ohio

W. O. SPRINGER has been appointed manager of the Cleveland Steel-Service plant of Joseph T. Ryerson & Son, Inc., Chicago 80, Ill. For the last fifteen years he has been in charge of the Cleveland Special Steels Division. Mr. Springer joined the Ryerson organization in 1929, and first served in the alloy, tool, and stainless steel department in Chicago. Soon after he was chosen to head the Special Steels Division at Cleveland. Mr. Springer has had a very wide experience in the application and treatment of steels.

W. O. Springer, Newly Appointed Manager of Ryerson Cleveland Steel-Service Plant

AUTOMOTIVE MAINTENANCE MACHINERY CO., North Chicago, Ill., announces that the Production Honing Machine Division of the company has been purchased by the C. ALLEN FULMER CO., 1220 First National Bank Bldg., Cincinnati, Ohio. The Fulmer organization will take over the manufacture and sale of the Hi-Speed production honing machine, and will service Hi-Speed machines now in use. The transaction applies only to the line of machines mentioned, and does not include any of the other Ammco machines.

A. H. KEETCH has been made head of the newly organized sales-service department of the Warner & Swasey Co., Cleveland, Ohio, after a two-year leave of absence on Government service. Mr. Keetch served in Washington as Chief of Priorities and Distribution Branch, Tools Division, War Production Board. Prior to entering Government service, he had served twenty years as representative and district manager of the Warner & Swasey Co. in Buffalo.

ROBERT E. BRIGGS has been appointed shop engineer of the Lima Locomotive Works, Inc., Lima, Ohio. IVAN B. WAGNER has been made senior assistant shop engineer, and HENRY WAGNER, JR., assistant shop engineer. Mr. Briggs, who has been associated with the company since 1942 as assistant shop engineer, succeeds W. N. McConkey, who recently died.

LODGE & SHIPLEY MACHINE TOOL CO., Cincinnati, Ohio, announces that the company plans to continue the Special Products Division, now engaged in war output, after the war. WILLIAM F. STAMETS has been appointed sales engineer for the division. He was previously connected with the Standard Steel Spring Co., St. Louis, Mo., as quality control engineer.

C. M. BOVARD was recently promoted from the position of chief draftsman to that of design engineer for the Cooper-Bessemer Corporation, Mount Vernon, Ohio, Diesel engine and compressor manufacturer. RALPH H. SCHLOSSER will succeed Mr. Bovard as chief draftsman.

HENRY E. HULL, formerly design engineer with the Parker Appliance Co., Cleveland, Ohio, has joined the staff of the Battelle Institute, Columbus, Ohio, where he will be engaged in research on production methods and processes.

FRANK J. KARG has been elected president of the Herman Machine & Tool Co., Tallmadge, Ohio, succeeding LEO HERMAN, who becomes chairman of the board.

Pennsylvania

FREDERICK G. SCHRANZ has resigned as vice-president of the Baldwin Southwark Division of the Baldwin Locomotive Works, Philadelphia 42, Pa. Mr. Schranz has held this post since 1941, and will continue to act in a consulting capacity. He has been associated with the organization since 1915. ROBERT G. ALLEN has been appointed general manager of the Baldwin Southwark Division. Mr. Allen has recently been placed on the inactive list of the U. S. Army, having served overseas with the rank of lieutenant colonel. Previous to entering the Army, he was president of the Duff-Norton Mfg. Co., Pittsburgh, Pa.

Frederick G. Schranz, Who has Resigned as Vice-president of Baldwin Southwark Division

G. V. LUERSSEN, of the Carpenter Steel Co., Reading, Pa., was awarded the Stoughton Plaque for outstanding achievement in metallurgical research at the annual meeting of the Lehigh Valley Section of the American Society for Metals held in Bethlehem, Pa. The award is made annually to the Lehigh Valley metallurgist who has accomplished the most outstanding and generally useful metallurgical work of the year. Mr. Luerssen has devised a

Robert G. Allen, Recently Appointed General Manager, Baldwin Southwark Division

Specialized

CORROSION PREVENTIVES

QUAKER

Quaker-developed "Dry-Type" Humidity Cabinet . . . one of 10 separate tests used in Quaker's Research Laboratory.

• To develop specific compounds of known ability to prevent corrosion under specific conditions of use . . . that is and has been Quaker's aim. In this work Quaker research chemists enjoy two tremendous advantages:

1. Not being restricted to the use of petroleum derivatives or by-products, they are free to draw from *all* sources of organic chemicals.

2. Having discarded most conventional methods of evaluating corrosion preventives as *too inaccurate*, Quaker research chemists have developed new and improved types of humidity cabinets and testing techniques.* These make possible accelerated laboratory tests that tie in with the many and varied conditions met in actual use.

The result has been the development of more than a score of FERROCOTES—*specialized* corrosion preventives each having a proved ability to protect precision parts under a specific set of environmental conditions.

A Quaker Process Engineer will gladly specify the particular FERROCOTES especially suited to protect your products . . . during processing . . . while in storage in your plant . . . during inter-plant shipment . . . and for final packaging.

Details of these will be sent on request to interested readers.

QUAKER CHEMICAL PRODUCTS CORP.

Other Plants in CHICAGO and DETROIT   Warehouse Stocks in Principal Industrial Centers

A Progressive Organization of Research and Process Engineers and Manufacturing Chemists

Name________________________ Position________________

. . . PLEASE PRINT COMPANY NAME AND ADDRESS IN MARGIN BELOW . . .

special means of testing tool steels, and is the author of numerous technical papers.

CARL A. SALMONSEN, formerly assistant manager of the General Electric River Works at Lynn, Mass., has been made manager of the company's Philadelphia Works. Mr. Salmonsen started as an office boy with the General Electric Co. in 1909 at Schenectady; later he became a machine shop apprentice, and, successively, a toolmaker, assistant foreman, general foreman, superintendent, general superintendent, and manager of one of the company's Canadian plants. He has been assistant manager of the River Works at Lynn since 1942.

GEORGE H. WOODARD, formerly manager of the Westinghouse Electric & Mfg. Co.'s new products division at East Pittsburgh, Pa., has been made manager of the company's aviation gas-turbine division for the manufacture of military and, later, commercial gas-turbine aircraft engines, based on the jet engine that has been developed by the Westinghouse organization for the United States Government. Mr. Woodard graduated from Cornell University in 1928 with a degree in mechanical engineering.

EUGENE J. REARDON has been elected vice-president and a director of the Superior Steel Corporation, Pittsburgh, Pa., succeeding DAVID PRYDE, who is retiring from active service. Mr. Reardon will have complete supervision of operations. He was previously chief engineer of the American Steel and Wire Co., Cleveland, Ohio. For the last five years he has been serving on the National Defense Research Committee.

COMMANDER R. E. W. HARRISON has rejoined the Chambersburg Engineering Co., Chambersburg, Pa., as vice-president in charge of sales, following his release by the Secretary of the Navy to an inactive duty status after four years of active service as a staff officer in various bureaus and offices of the Navy Department.

CLEVELAND TWIST DRILL CO., Cleveland, Ohio, announces that the Firth-Sterling Steel Co., McKeesport, Pa., has been added to the list of firms that are licensed to produce "Mo-Max" molybdenum-tungsten high-speed steels. This company will market "Mo-Max" steels under the trade names "Hi-Mo" and "Super Hi-Mo."

W. G. KERR CO., announces its removal to 520 Oliver Bldg., Pittsburgh 22, Pa. For the last ten years, the company has been representative in western Pennsylvania and part of West Virginia for the variable-speed control units made by the Reeves Pulley Co., Columbus, Ind. The company also represents the Foote Bros. Gear & Machine Corporation, 5225 S. Western Blvd., Chicago 9, Ill.

ALLEN GAUGE & TOOL CO., 421 N. Braddock Ave., Pittsburgh 21, Pa., has completed an addition to its plant. The new structure is 80 by 100 feet, and will increase by 40 per cent the capacity of the company's thread-grinding department.

G. EDWARD PORTER has retired as supervisor of tool equipment with the General Electric Co. at Erie, Pa., a post that he has held for the last thirty-four years, and is now enjoying a well earned rest at his home at 100 N.E. 104th St., Miami, Fla.

S. B. HEPPENSTALL, JR., formerly vice-president in charge of sales of the Heppenstall Co., Pittsburgh, Pa., has been elected vice-president of the H. K. Porter Co., Inc., of Pittsburgh.

E. CLAIR BOOK has been appointed assistant purchasing agent for the Lukens Steel Co., Coatesville, Pa., and its divisions, the By-Products Steel Corporation and Lukenweld, Inc.

D. P. MORGAN has joined the sales staff of the Pittsburgh Steel Foundry Corporation, Glassport, Pa., as assistant sales manager of the Philadelphia district.

Tennessee and Texas

AMPCO METAL, INC., 1745 S. 38th St., Milwaukee 4, Wis., announces the opening of a field engineering office at 818 McGhee Ave., Knoxville 17, Tenn. J. M. MORRISON is in charge of the new office, which will serve the states of Florida, Georgia, Tennessee, and North and South Carolina. Mr. Morrison's office was previously located in Jacksonville, Fla.

PERRY MACHINERY CO., Dallas, Tex., has been appointed a special distributor of Tocco process inspection heat-treatment equipment by the OHIO CRANKSHAFT CO., Cleveland 1, Ohio.

Wisconsin and Minnesota

DELTA MFG. CO., Milwaukee, Wis., announces that PAUL R. LEONARD, Transportation Corps Detachment, Brooklyn Army Base, Brooklyn, N. Y., is the winner of the $1000 first prize in the Delta Home Work-shop Contest to determine the best design for home work-shops. The second prize, consisting of $500, was awarded to TED KOSTEW, Ozone Park, N. Y., and the third prize, of $250, to FELDER S. WEEKS, Milan, Tenn.

C. P. PESEK has been appointed administrator of engineering of the Minnesota Mining & Mfg. Co., St. Paul, Minn. W. A. THOMAS, assistant chief engineer, has been made engineering consultant on Mr. Pesek's staff.

Army-Navy "E" Award Renewals

The concerns in the machine-building industries continue to maintain their fine record for production of war materials. Two firms in this field have recently been signally honored by receiving the fifth renewal, which means the sixth consecutive award, of the Army-Navy "E." One of these companies—the Lodge & Shipley Machine Tool Co.—announces that two of its plants in Cincinnati, Ohio, have been awarded the fifth renewal of the Army-Navy "E" Production Award, which maintains an unbroken chain of renewals since the workers and management first received the award. Plant 1 of the company is devoted to the building of lathes required in the production of all types of war materials, while Plant 2 produces truck transmission units and other war accessories.

Another company that has recently received for the sixth time the Army-Navy "E" Production Award is the Mesta Machine Co. of Pittsburgh, Pa., the first company in the Pittsburgh district to be so honored. The Mesta Machine Co. was one of the first companies to be given the Navy Bureau of Ordnance "E" Award, which was presented to the company on September 11, 1941. It later received the All-Navy "E" Burgee, and subsequently the Army-Navy "E" Award, to which has now been added the fifth star.

Other companies that have received renewals are as follows: Borg-Warner Corporation, Bellwood, Ill., has been awarded a fourth white star to add to its Army-Navy "E" Production Award flag. Heller Bros. Co., Newcomerstown, Ohio, and the American Foundry Equipment Co., Mishawaka, Ind., have been awarded a third white star for continued high production of war materials.

* * *

Taft-Peirce Assigned Approved Quality Control Rating

The Taft-Peirce Mfg. Co., Woonsocket, R. I., has been assigned what is known as "Approved Quality Control Rating" by the Army Air Forces. This classification was conferred by Major Robert G. Olmstead, New England regional representative of the U. S. Army Air Forces, with this statement: "The Quality Control as established by your company has demonstrated that your inspection organization can be entrusted with full responsibility that your products pass all requirements as established by the Army Air Forces, and your company is hereby assigned an 'Approved' Quality Control Rating. Duplication of inspection during detail fabrication by Air Forces personnel will be eliminated."

*Suggestion Number One was Kennametal "Universal" Blanks

USE A LIGHTER KENNAMETAL TOOL, IN A "HOME-MADE" ADAPTOR, ON FINISH-TURN OPERATIONS

Efficient use of carbide tools—always important—is imperative today, because of the demands of a large shell-making program. Every possible means for promoting economy should be utilized to avoid tool shortages, and consequently delayed production.

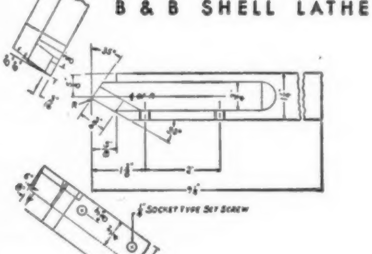
On most finish-turn operations carbide can be conserved, and tooling costs can be reduced, by using tools 1" square or smaller, mounted in the tool block by means of a simple adaptor which can readily be made in any shop. For example, in a major shell-plant, the finish-turn operation on a 155mm shell, using a 1½" square-shank Kennametal-tipped tool, required .72 calculated grams of Kennametal, at a tool cost of 8¢ per shell—very economical production. Yet, by using a ¾" square-shank Kennametal-tipped tool in an adaptor, carbide consumption was cut in half (.36 calculated grams), and tool cost was reduced to 3.3¢, per shell finish-turned.

The diagrams at the left show how ¾" square-shank tools can be mounted in adaptors that fit tool holders built to take shanks 1¼" or 1½" wide. Similar adaptors can be devised and made by you for other conditions. On lathes built to take tool shanks 1" x 1½", or 1" x 1¾", it is economical to use a ½" or ¾" shim under a 1" square-shank Kennametal-tipped tool.

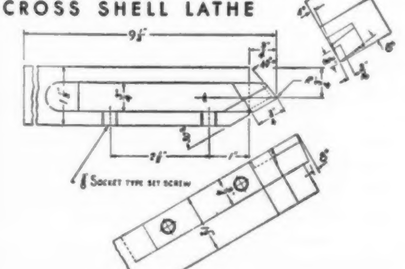
By using inherently efficient Kennametal, in conservative size blanks, as suggested above, a two-way saving in carbide consumption can be effected.

TWO TYPES OF ADAPTORS THAT YOU CAN EASILY MAKE*

SHANK ADAPTOR FOR B & B SHELL LATHE



SHANK ADAPTOR FOR CROSS SHELL LATHE



* Kennametal Inc. does not manufacture or sell adaptors. The sketches above are typical suggestions for making your own adaptors. Blue prints from working drawings will be furnished on request.

Kennametal engineers, fully experienced in the application of cemented carbides, will be glad to help manufacturers get the best and longest tool service in shell production.

KENNAMETAL
SUPERIOR CEMENTED CARBIDES
TRADE MARK REG. U. S. PAT. OFF.
KENNAMETAL Inc., LATROBE, PA.

Obituaries

Moffett Studios

Walter Byron Smith

Walter Byron Smith, chairman of the board of directors of Illinois Tool Works, Chicago, Ill., passed away suddenly on April 2 at his office in Chicago, aged sixty-six years. Mr. Smith had been active for many years in the management of the Illinois Tool Works and its affiliated companies—Shakeproof Inc., and Canada Illinois Tools, Ltd., of Toronto, Ontario, Canada.

Mr. Smith had been a director of the company since its beginning in 1915, and in association with his brothers—Solomon A., Harold C., and Bruce D.—and Frank W. England and Carl G. Olson, contributed much to its steady growth. Following the death of his brother, Harold C. Smith, in 1936 he was made chairman, and during recent years he had been extremely active in guiding the broad war production program of his company. Mr. Smith was a strong believer in engineering development as the practical means for manufacturing progress, and his foresight and encouragement contributed greatly to the achievements of his companies in the cutting tool and fastening fields.

In addition to his manufacturing interests, Mr. Smith was very active in the financial and civic affairs of Chicago. He was a director of the Northern Trust Co., trustee and treasurer of the Art Institute, trustee and vice-president of St. Luke's Hospital, trustee of John Crerar Library, trustee and treasurer of Glenwood Manual Training School, and was prominent in the management of several other civic and charitable organizations.

Mr. Smith was born and reared in Chicago, and educated at Yale University. He is survived by his widow, a daughter, and two brothers.

Walter E. Marble, a salesman for the D. A. Stuart Oil Co., Chicago, Ill., for fifty-four years, died on March 18 at the Illinois Masonic Hospital, following an operation. He was eighty-six years old. Up to the time of his death he was engaged in making personal calls on metal-working concerns in the Chicago area. Mr. Marble was born in Woodstock, Vt., on September 28, 1858. He moved to Chicago in 1879 during the period of reconstruction after the great Chicago fire. His first job as an oil salesman was with the B. V. Page Co., with whom he started work in 1880. Later he was employed by the Standard Oil Co. of Indiana. In 1891, he obtained a position with the D. A. Stuart Oil Co. with whom he was associated for the rest of his life. He is survived by a daughter, Miss Elizabeth W. Marble.

George H. Wright, among the first to produce stainless steel and a contributor to many improvements in metals since he began working in 1902 at the Works Laboratory of the General Electric Co. in Schenectady, died on March 26 at the age of sixty-two years.

Mr. Wright was recognized as an authority in the development of uses for new metals and for his contribution to the manufacture and adoption of high-speed cutting steels. He produced the material known as "Calorite," now almost universally used as resistors in electric furnaces, stoves, and flat-irons. During the last two decades, he had concentrated on the improvement of high-temperature and high-strength materials for use in steam turbines.

Amedee H. Smith, chairman of the board of directors of the Hyster Co., Portland, Ore., and president of the Willamette Iron & Steel Co., died on March 25 in Portland, at the age of seventy-six. Mr. Smith was one of the best known business leaders of the West Coast. In addition to the connections mentioned. he was a director of the Portland General Electric Co. and president of the Oregon Paramount Corporation. He was extremely active in civic and other affairs of the community, and at one time was president of the board of trustees of Willamette University.

Joseph F. Shepherd, manager of the Service Engineering Department of the Sheffield Corporation, Dayton, Ohio, died suddenly at his home in Dayton on March 18. Mr. Shepherd had been with the Sheffield Corporation for twenty-two years. After serving his apprenticeship, he was made assistant foreman, then foreman, and finally appointed to the position that he held at the time of his death. He was well known throughout the country because of his many contacts with industrial plants.

G. Tell Dubois, district sales manager in the Detroit, Mich., territory for the Potter & Johnston Machine Co., Pawtucket, R. I., died on April 3 at the age of fifty-five years. He had served the interests of the Potter & Johnston Machine Co. for nearly nineteen years. Prior to his connection with that organization, Mr. Dubois was engaged in the manufacture of special tools. He leaves many friends throughout the Michigan and Ohio territories.

Leroy F. Johnson, for the last ten years Chicago district sales manager of the Vanadium Corporation of America, New York City, died on March 9 at Elmhurst, Ill., aged fifty-three years.

* * *

Westinghouse Issues New Monthly Publication

The first issue of Westinghouse *Newsfront*, a new monthly publication issued by the Westinghouse Electric & Mfg. Co., appeared in April. This four-page publication, printed in two colors and illustrated with drawings and photographs, contains brief items describing the latest achievements of the company in the fields of scientific research, engineering, and production. Those interested may be placed on the mailing list by addressing Editor, Westinghouse *Newsfront*, 306 Fourth Ave., Box 1017, Pittsburgh, Pa.

* * *

Directory of Connecticut Engineering Facilities

The Manufacturers Association of Connecticut, Inc., Hartford, Conn., in cooperation with the War Production and Engineering Council of Northern Connecticut, has published a directory of Connecticut research and engineering facilities, designed especially to aid the smaller industries without research facilities to locate engineering and research assistance. This directory is available not only to manufacturers, Chambers of Commerce, universities, and libraries in the state of Connecticut, but in other states as well.

* * *

Helicopters for Commercial Use

Helicopters capable of carrying five passengers, or any type of equivalent load, are being developed by a well-known aircraft company. These helicopters are designed specifically for commercial work, and embody two and one-half years of experience with two experimental helicopters, on which numerous improvements are being made in the new designs.

New Books and Publications

SCREW-THREAD STANDARDS FOR FEDERAL SERVICES—1944. 274 pages, 8 by 10 inches. Published by the National Bureau of Standards, United States Department of Commerce. Available from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. Price, 60 cents.

The Interdepartmental Screw-Thread Committee has been established by the Departments of War, Navy, and Commerce to promote uniformity in screw-thread standards in the departments concerned. The committee is charged with the development of standards for screw-threads, the standardization of gages, dies, and taps, and the standardization of dimensions of nuts, bolt heads, wrenches, and other items associated with the manufacture and use of interchangeable threaded parts. The present book contains the results of the work of the committee. It is a handbook of screw-thread standards, and contains a wealth of tabular data relating to screw threads and threaded parts, such as standard set-screws, nuts, etc.

PRODUCTION ENGINEERING IN THE AIRCRAFT INDUSTRY. By A. B. Berghell. 307 pages, 6 by 9 inches; numerous illustrations. Published by the McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 18, N. Y. Price, $3.

This book is the outgrowth of courses in production engineering taught by the author in the War Training courses at the University of Southern California and the University of California. These courses were designed to train personnel for the aircraft industry during the rapid expansion in that field necessitated by the war production program. The book deals with time standards and their application to fabricating and machine operations; work simplification and suggestion systems; operational sequences and organizational work in different departments; saving of materials; determination of labor costs; control of direct labor hours and costs; budgeting; and the relations between management and shop.

PERSONNEL RELATIONS. By J. E. Walters. 547 pages, 6 by 9 inches. Published by the Ronald Press Co., 15 E. 26th St., New York 10, N. Y. Price, $4.50.

This book, according to the preface, endeavors to set forth both principles and practice in the field of personnel relations as it is today. It includes in its scope the varying phases of personnel relations as determined and influenced by workers in labor unions; managements; the Government; labor-management cooperation; individual employes; and personnel relations, techniques, and procedures. The theme running throughout the book is the application of these principles and practices in a democracy. It is the hope of the author, who is a personnel relations consultant and has had a wide experience in this field, that the book will aid each group to see the viewpoints of the other groups to the end that we may move onward toward the goal of better personnel relations in a stronger democracy.

MACHINE DRAWING. By Carl L. Svensen. 280 pages, 6 by 9 inches. Published by the D. Van Nostrand, Co., Inc., 250 Fourth Ave., New York City. Price, $2.50.

This is the third edition of a text and problem book on machine drawing written especially for technical students and draftsmen. It covers: Elementary Principles; Threaded Fastenings; Welded and Riveted Construction; Principles and Practice of Dimensioning; Machine Drawing; Machine Sketching; Machine Details; Bearings; Pulleys, Belts, etc.; Shafting and Couplings; Jigs, Fixtures, and Details; Gears and Cams; and Piping Drawings. A great many new problems are included in this edition, and some new material has been added.

Coming Events

OCTOBER 1-3 — Fall meeting of the AMERICAN SOCIETY OF MECHANICAL ENGINEERS in Cincinnati, Ohio. C. E. Davies, secretary, 29 W. 39th St., New York 18, N. Y.

NOVEMBER 26-30—Annual meeting of the AMERICAN SOCIETY OF MECHANICAL ENGINEERS in New York City. C. E. Davies, secretary, 29 W. 39th St., New York 18, N. Y.

* * *

Lincoln Text-Book Awards

A booklet is now available giving complete information about the Lincoln text-book award program mentioned in April MACHINERY. This booklet, entitled "Rules and Conditions—$20,000 Award Program for Text-Books Covering Machine and Structural Design for Modern Processes, Including Welding," can be obtained from the James F. Lincoln Arc Welding Foundation, Cleveland 1, Ohio.

Unprecedented Increase in Magnesium Production

One of the factors that will influence the use of magnesium products in post-war years is the quantity of this metal now available. Before the war, magnesium was produced at the rate of slightly over 6,000,000 pounds a year. In 1940 its production was doubled, and in 1941 the output grew to 33,000,000 pounds. This increase was due chiefly to the demands of the expanding aircraft industry. At the present time, more magnesium is produced per month than was produced in the entire year of 1941, the peak production in 1944 being around 500,000,000 pounds.

This magnesium is supplied by eleven producers operating fifteen plants and utilizing three basic processes. The principal process employs electrolytic reduction of fused magnesium chloride. Brine, sea water, magnesium salts, and magnesite are the raw materials from which magnesium chloride is obtained. The other processes depend on the direct production of magnesium oxide—one using carbon and the other ferro-silicon as the reducing agent.

More than three-fourths of the magnesium produced during the war has been employed in aircraft and incendiary bombs. By using magnesium in the landing wheels of planes, it has been possible to save from 50 to 150 pounds in weight per plane on medium and heavy models. The metal has excellent resistance to shock and to landing stresses. A heavy bomber uses as much as 1600 pounds of magnesium, a light bomber 800 pounds, and a fighter plane about 500 pounds.

* * *

Employment of Veterans

A manual for foremen entitled "You and the Returning Veteran" has been published by the Allis-Chalmers Mfg. Co., Milwaukee 1, Wis. In the preparation of this manual, the company has called upon such outside sources of information as were available, and, in addition, has been aided by its own experience in the employment of more than 1100 veterans of the present war. The book will be sent without charge to any interested group or employer.

* * *

It is the natural and inherent right of every man to decide for whom he will, or will not, work. It is also the natural and inherent right of every man to decide who shall, and who shall not, work for him. Man-made laws may—and in the United States today do—deprive him of this right, but such laws deny the fundamental rights inherent in a democracy.

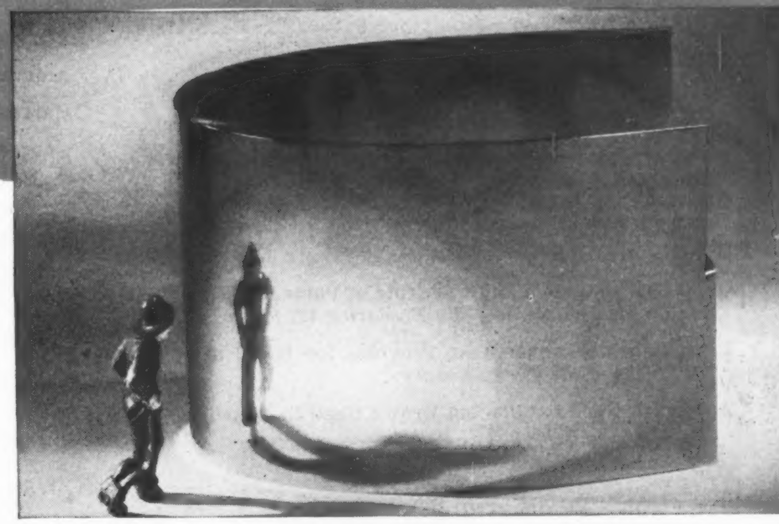
EASTERN STAINLESS offers a Sheet Mill Finish for Every Need!

Producing Stainless Steels exclusively, Eastern Stainless offers you an extensive range of desirable sheet mill finishes—three of which are illustrated here.

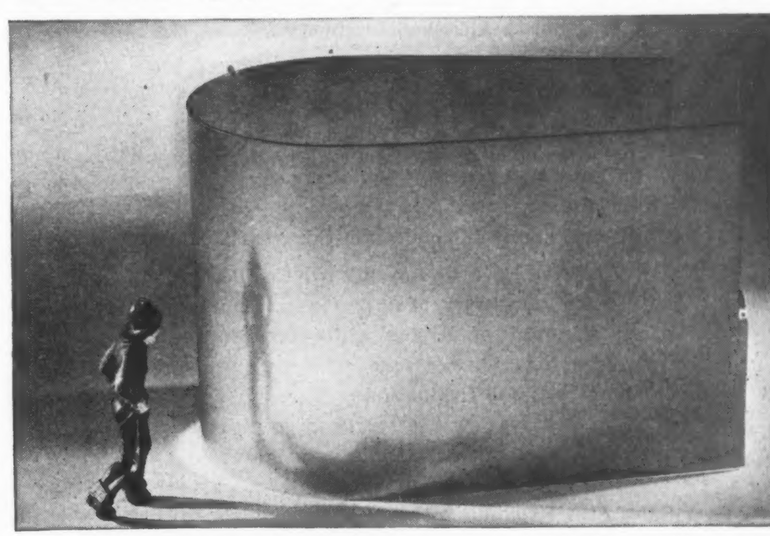
The full range extends from a superbly polished and highly reflective Eastern Stainless No. 7 Finish—polished one or both sides as specified—to various ground or cold rolled surface conditions and finally to the dull but dense pickled Eastern Stainless No. 1 Finish. Such variety is certain to meet any specific requirements, including exceptional corrosion resistance, ease of cleaning, architectural beauty and highest performance in fabrication.

Eastern Stainless possesses unusually desirable combinations of cold forming and drawing properties, strength, ductility and weldability in addition to these surface finishes. Available in twelve standard and additional grades as required, Eastern Stainless now is specified for an extensive number of applications in widely diversified industries.

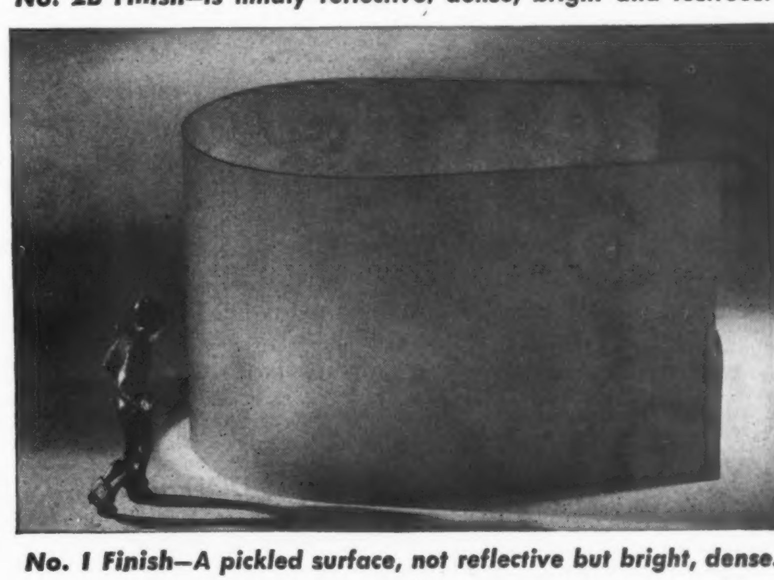
Eastern Stainless Technical Staff will gladly assist with your problems. Feel free to ask Eastern for the answer whenever Stainless is the question.



No. 4 Finish—Highly reflective, possesses a silvery appearance.



No. 2B Finish—Is mildly reflective, dense, bright and lustrous.



No. 1 Finish—A pickled surface, not reflective but bright, dense.

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Classified Contents of This Number

Your Progress Depends Upon Your Knowledge of Your Industry